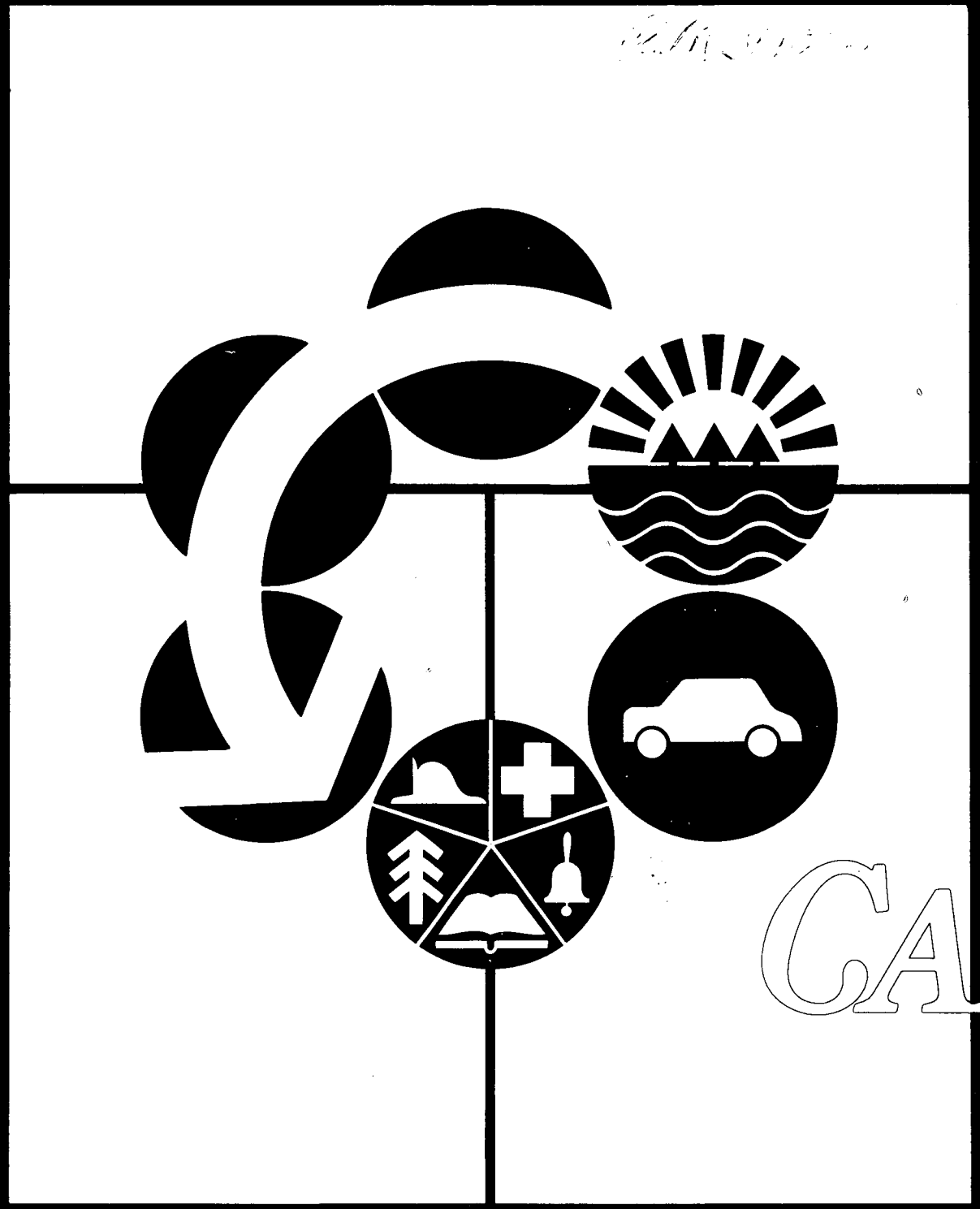

fourth
annual
GROWTH POLICY
report
of
the
MONTGOMERY
COUNTY
PLANNING
BOARD
october
1977

CARRYING CAPACITY & ADEQUATE PUBLIC FACILITIES

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

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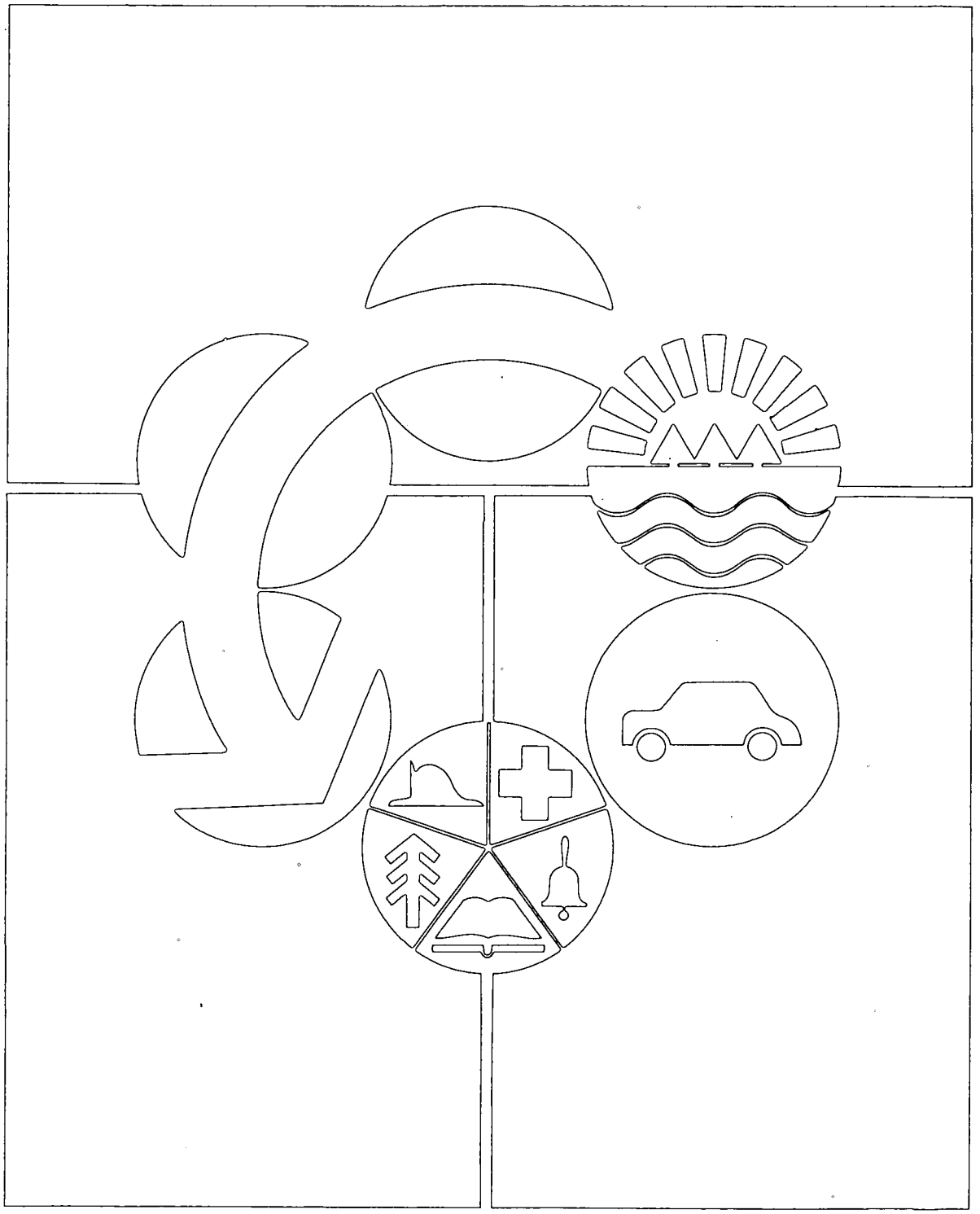
The Maryland-National Capital Park and Planning Commission is a bi-county agency created by the General Assembly of Maryland in 1927. The Commission's geographic authority extends to the great majority of Montgomery and Prince George's Counties: The Metropolitan District (for parks) comprises 919 square miles in the two counties, while the Regional District (for planning) includes 1,001 square miles.

The Commission has three major functions: (1) the preparation, adoption, and from time to time, amendment or extension of the General Plan for the physical development of the Maryland-Washington Regional District; (2) the acquisition, development, operation, and maintenance of a public park system in the Maryland-Washington Metropolitan District; and (3) in Prince George's County, the operation of the entire County public recreation program.

The Commission operates in each County through a Planning Board, appointed by and responsible to the County Council. All local plans, recommendations on zoning amendments, administration of subdivision regulations, and general administration of parks are responsibilities of the Planning Boards.



Fourth Annual GROWTH POLICY REPORT

October 1977

Carrying CAPACITY & Adequate Public Facilities

TITLE:	CARRYING CAPACITY AND ADEQUATE PUBLIC FACILITIES, Fourth Annual Growth Policy Report of the Montgomery County Planning Board
AUTHOR:	The Montgomery County Planning Board of The Maryland-National Capital Park and Planning Commission
SUBJECT:	Proposal for future study of staging growth to assure adequate public facilities: and the impact of building out the development pipeline on public facilities
DATE:	October 28, 1977
PLANNING AGENCY:	The Montgomery County Planning Board of The Maryland-National Capital Park and Planning Commission
SOURCE OF COPIES:	The Maryland-National Capital Park and Planning Commission, 8787 Georgia Avenue, Silver Spring, Maryland 20907
SERIES NUMBER:	0643782500
NUMBER OF PAGES:	128
ABSTRACT:	This document integrates the concepts of carrying capacity, adequate public facilities, capital programming, and forecasting into a comprehensive growth management system. It presents recommendations to permit continued study. The impact of proposed residential development which has authorization to hook into the sewer system is analyzed as to its effect on absorbing the unused capacity of: 1) existing zoning, 2) the sewer system, 3) the transportation network, and 4) the school system. The methodology used in the analysis is described.

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INTRODUCTION

This is the fourth in a series of annual growth policy reports. These reports are intended to help focus an evolving perspective of the growth management process in the County and to assist in the guidance and coordination of the many ongoing activities that together constitute that process over the year. This series of reports constitutes an organic whole, and reference to previous reports will assist the reader.

The first report, called Framework for Action, laid out a basic conceptual model of the growth management process, a description of the issues the County had to deal with, and a general policy approach to these issues, together with some specific strategy recommendations.

The second report, called Fiscal Impact Analysis, tested the fiscal implications of alternative future rates of growth. It also developed the concept of how to use fiscal impact analysis and other measures, such as levels of public service, so as to provide a computerized analytic tool that can be used to test a wide variety of possible growth options. This technical document was followed shortly thereafter by a policy document, entitled Sequel No. 1--Environment and Transportation. This sequel report dealt with the policy implications of the fiscal impact analysis, in the functional areas of environment and transporation, and recommended certain specific action strategies.

The third report, called Forecast--People, Jobs and Housing, was a technical report that documented the Planning Board's most recent forecasts. It included a detailed outline of the methodology and assumptions used in arriving at these forecasts, and was followed by discussions within the County as to the manner in which such forecasts should be used generally in the various parts of the planning process.

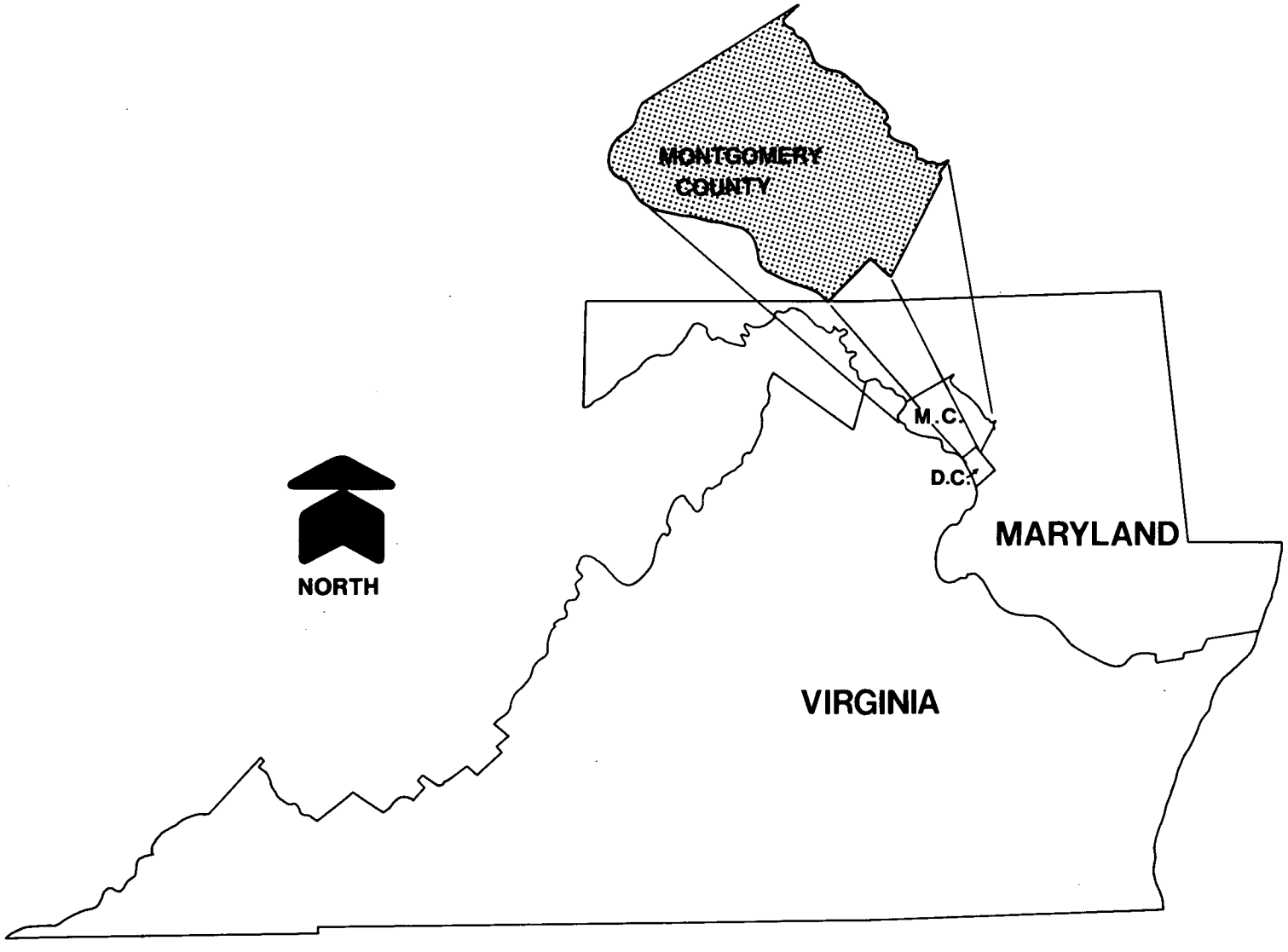
This year's fourth report, called Carrying Capacity and Adequate Public Facilities, is a logical extension of the previous work; and continues the theme of examining each year, in detail, one major component or aspect of the growth management process.

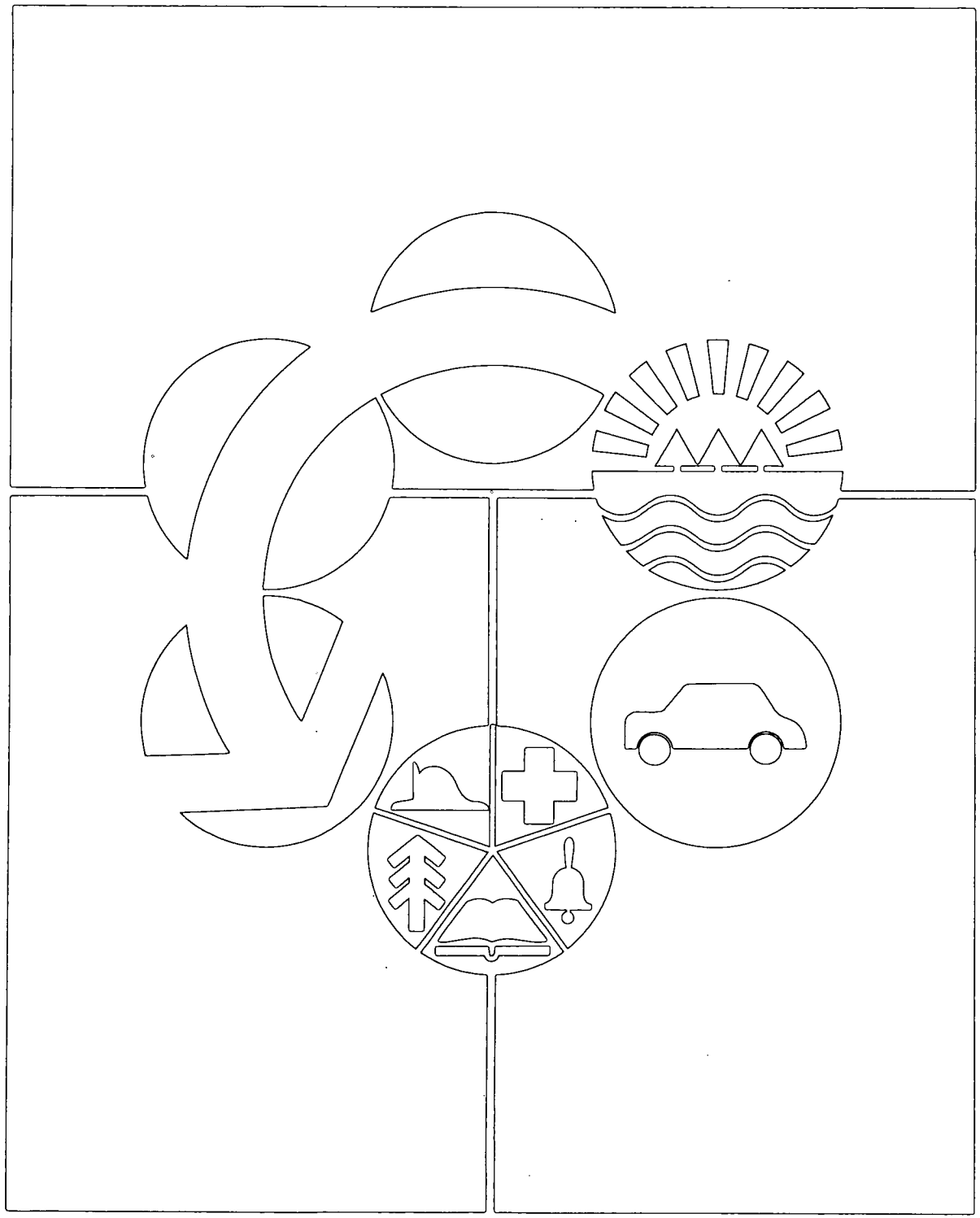
The current report focuses on the presently existing Adequate Public Facilities Ordinance and moves out from this point of focus to the broader conceptual base and technical underpinnings of the growth management system as a whole. The report concludes with some specific recommendations for amendments to the Adequate Public Facilities Ordinance, and with some proposals for improving other elements of the growth management system.*

Chapter I traces the connection from the Adequate Public Facilities Ordinance through the rest of the growth management system, and concludes with specific action recommendations. Chapters II through VII are technical in nature and describe some detailed impact assessment measure ments that thave been made possible by the introduction of several new computerized monitoring systems. Chapter VIII is an Executive Summary.

* *Subsequently referred to in this report as the APF Ordinance.*

Montgomery County's Location Within MD.-D.C.-VA. Region





Chapter One

CARRYING CAPACITY & GROWTH MANAGEMENT

CHAPTER 1

GROWTH MANAGEMENT AND CARRYING CAPACITY

Prior to 1970, urban planning was largely based on the implicit concept of growth "accommodation." Since 1970, planning has increasingly moved towards the explicit concept of growth "management." The difference between the two concepts is that "management" connotes a much stronger element of governmental control than does "accommodation."

This element of governmental control is important within a constitutional democracy such as the United States. Judicial interpretations of constitutional constraints on the police power of government protect the civil and property rights of individuals. To extend the police power requires justification in terms of the public interest. Such justification not only must be deductively logical in arguing from cause to effect. It must also be bottomed on some axiomatic principles that have developed sufficient social sanction as to seem self-evident to a court during judicial review.

The planning shift from "accommodation" to "management" has created the intellectual need to develop a new set of underlying concepts and axiomatic principles to replace the older "accommodation" set that focussed around the notion of unbounded vistas and constant expansion. While there is as yet no clear mandate on this matter, there does seem to be a currently emerging concensus that is converging on the notion of "carrying capacity," as the nucleus of such a new set of axiomatic principles.

The term "carrying capacity" derives from the language of ecology and agriculture. There it refers to the maximum number of animals of a given species that can graze, or otherwise feed off the food chain resources, of a particular area of land, without destroying the food supply. The extension of the concept to apply to the amount of urban growth that can be safely accommodated within an urban area is a new intellectual endeavor. Essentially, it involves the idea that there can be defined a set of critical internal linkages within each of the set of systems that together constitute the full complexity of the urban fabric, and that a threshold stress capacity can be established for these critical linkages, beyond which that particular system will be somehow damaged or forced to function in an unacceptable manner. Such a deterioration in the performance of one stress-damaged system may, in turn, be sufficient to undermine the aggregate health of the total urban organism. The analogy to medical science and the human bodily systems is obvious. Compare, for instance, the known interrelationship between the blood circulation system and the effects of obesity and stress, leading to potential heart attacks.

To apply the carrying concept to urban growth management, it becomes necessary to define the systems to be analyzed and to invent techniques for measuring and modelling the state of these systems. Again, the medical analogy to cardiograms and encephalographs seems relevant.

In summary, this line of reasoning is as follows. To successfully implement comprehensive growth management controls requires the ability to sustain them in court. To sustain them in court requires an integrated intellectual rationale that is bottomed on some new axiomatic principles. The most promising contender for this axiomatic principle role appears to be the carrying capacity concept. The remaining challenge is to translate this carrying capacity concept into a set of definable systems, analogous to those of the medical field, that can be technically measured, monitored, and

used as guides to the successful management of urban growth.

The framework for such a set of systems was developed in the Planning Board's first growth policy report in 1974. In the intervening years, it has been refined and developed. We believe it remains a useful starting point from which to address the current issues and practical problems that confront the County today.

Accordingly, this chapter will move from the broad perspective of the comprehensive Growth Management Model (GMM) to the discussion of the specific element of that model, the APF Ordinance; and then back up again to the scale of the total comprehensive model. The Conclusion section contains recommendations for action at both scale levels.

CARRYING CAPACITY AND ADEQUATE PUBLIC FACILITIES

The comprehensive GMM is represented graphically by the logo on the cover of this report. The six circles in total represent the carrying capacity component of the model, and individually represent the six urban system elements, into which the entire fabric of the urban pattern can be divided: People, Jobs, Housing, Community, Transport, and Nature (See Figure 1.1). The three rectangles represent the three major divisions of the institutional process of growth management: Comprehensive Planning, which tries to take account of all interrelationships; Private Land Use Regulation, which must be kept within the bounds of constitutional constraints; and Public Facilities Provision, which is limited by the fiscal constraints of taxation sources. (See Figure 1.2).

Within the carrying capacity component, a generic equation was developed in order to link the individual citizen's amorphous or random perceptions of the

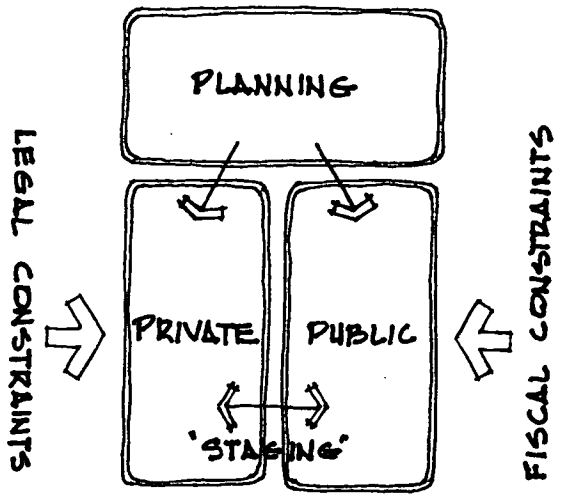


FIGURE 1-1

FIGURE 1-2

effects of growth, to potential future concrete measurements within the six urban system elements:

$$\frac{\text{Amenity}}{\text{Population}} = \text{Quality of Life}$$

As used here, "amenity" is a general term meaning the sum of all the things that people perceive they need in order to experience a total quality of life. If the amenity remains constant and the number of people increase, the quality of life will be perceived to decline, and vice versa. Although it is not possible to measure such an amorphous commodity as "amenity," it is possible to use this general equation as the base from which to develop more specific equations that can be measured.

Thus, for instance, by substituting, in turn, each of the six elements for the term "amenity" in the above equation, we can theoretically develop a set of equations for employment or income balance (= Jobs ÷ Population), for overcrowding or rental cost balance (= Housing ÷ Population), for public health and welfare balance (= Community ÷ Population), for open access and opportunity balance (= Transport ÷ Population), for balance between environmental pollution and physical health (= Nature ÷ Population), and even for social and fiscal balance (= People ÷ Population),[1]

Figure 1.3 illustrates that each of the six elements can be divided into a public and private section. Thus, the People element in its private component consists of individuals, and such interpersonal relationships as families, clients, purchasers, contractors, etc.; while in

[1] To understand the last equation properly, think of tax revenue as a function of government, and government as a function of "People." The succeeding paragraph will help explain this.

its public component it consists of legislatures, courts and agencies of government. Similarly, Community in its private component consists of such things as private clubs, separate schools, churches, commercial theatres, etc.; while in its public component it consists of such government-operated facilities as public schools, libraries, police, fire and welfare services, etc.

By focussing on the public component of the six elements, it is possible to narrow down the subject matter to the relationship between the public sub-elements and the population they serve. This gives rise to a second, and more narrowly focussed, generic equation:

$$\frac{\text{Public Facilities \& Services}}{\text{Population}} = \text{Level of Service}$$

By using this concept of level of service as a surrogate for the quality of life, it is possible to move much closer to a practical technique for mathematically measuring the relationships involved. By narrowing the focus once more after this step, we come to the concept we have called the APF concept. This next step derives from the observation that the relative proportion of public to private within the three elements of Community, Transport, and Nature, is much higher than among the other three. Government has been mandated a strong responsibility for the maintenance of community public facilities, adequate roads and transit, and freedom from environmental pollution. By contrast, the maintenance of balance in housing, jobs, and interpersonal relationships is perceived as much more a matter for private transactions.

Thus, while the full quality of life perception obviously embaces the full range of all six elements, it is logical and practical for the County's growth management process to focus on the public components of the three

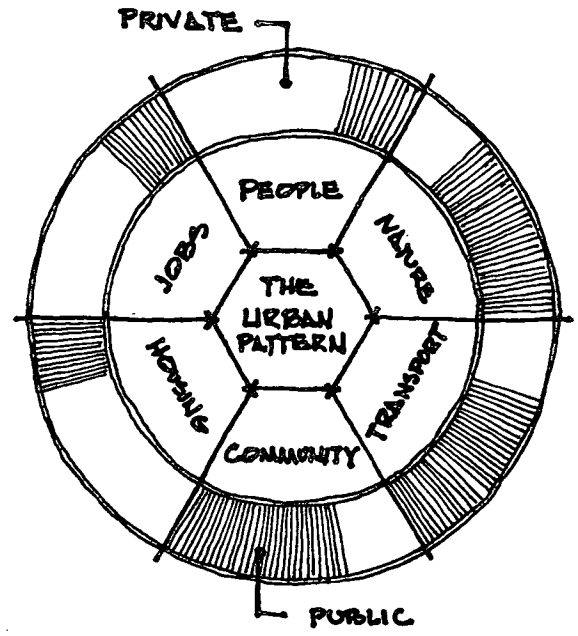


FIGURE 1-3

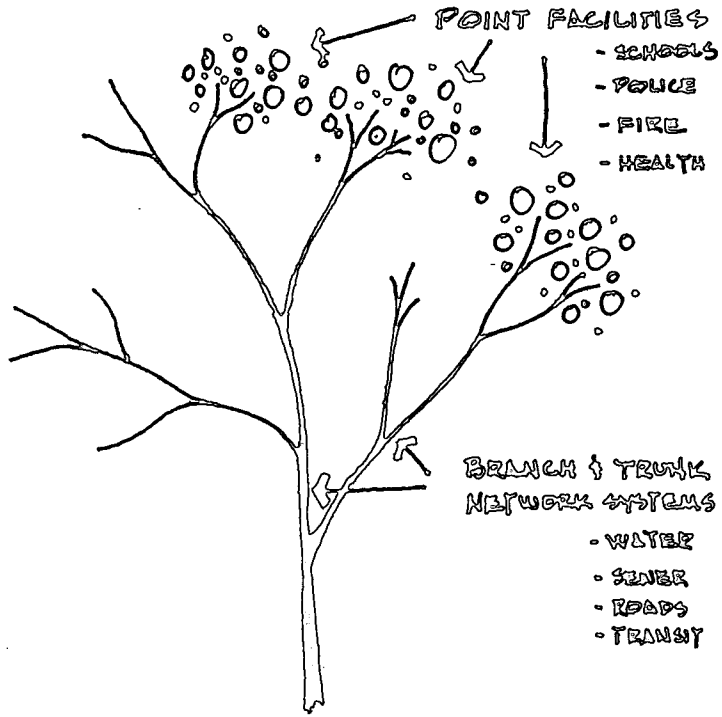


FIGURE 1-4

elements for which society has assigned a major burden to government. It is the public components of the three elements of Community, Transport, and Nature, which encompass the range of facilities that are implied in the APF concept as it is used in Montgomery County's present growth management approach.

Thus, the concept of "staging," as used in Montgomery County, essentially involves the ability of local government to maintain a dynamic balance between new growth on the private side of the ledger, and new growth on the public side of the ledger. It is the maintenance of such a balance over time, between the total amount of private development in the County, and the total amount of public facilities to serve it, that constitutes the essence of the APF concept.[2]

At the present time, the APF concept is manifested concretely within the growth management process by an APF Ordinance, which identifies eight specific facilities that fall within the above three urban system elements: water and sewer (Nature); roads and transit (Transport); and schools, police, fire, and health clinics (Community). The 1974 report showed how the Nature and Transport facilities could be viewed as network systems, analogous to a tree with branches and trunk; whereas Community facilities could be viewed as points in space, which, compared to the network systems, are small in scale and analogous to the leaves on the tree (see Figure 1.4).

This distinction between the two network systems and the point facilities is useful because it highlights the

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2 This definition assumes the existence of an adopted General Plan, which proposes a geographic pattern under which both the private and public growth, when fully completed, will be properly related to each other in space.

fact that the two network systems are the major shapers of urban form. As individuals, we perceive the urban pattern largely in terms of masses of individual buildings; but it is the network of roads, transit, water and sewer that determine the buildings' locations. By analogy, we perceive a tree in summer largely by the massing of its leaves; but it is the configuration of its trunk and branches that underlies this visual result.

The Adequate Public Facilities Ordinance

The Montgomery County APF Ordinance is an adjunct to the Subdivision Ordinance. This means that it is not until an individual parcel of land has been brought by its owner to the Planning Board for subdivision approval that a measurement of adequacy will be performed. Subdivision approval is just one point in a flow of events through time, a flow through which an individual parcel of land moves from a status of being vacant to that of being fully developed. This sequence of events is illustrated by Figure1.5,using the Growth Management Model as a framework.

The parcel must first receive a zoning category by action of the County Council action. Within this constraint, it must then receive a subdivision approval by action of the Planning Board. Within this constraint, it must then receive a sewer authorization by action of the Washington Suburban Sanitary Commission. And within this constraint, it must then receive a building permit by action of the County Government action. A final step not shown is the granting of an occupancy permit, after demonstration that the final developed project is in conformance with all of the above requirements. Also noted is the fact that certain zoning categories require site plan review by the Planning Board.

If a parcel of land required no further subdivision permit, either to divide it into smaller pieces or

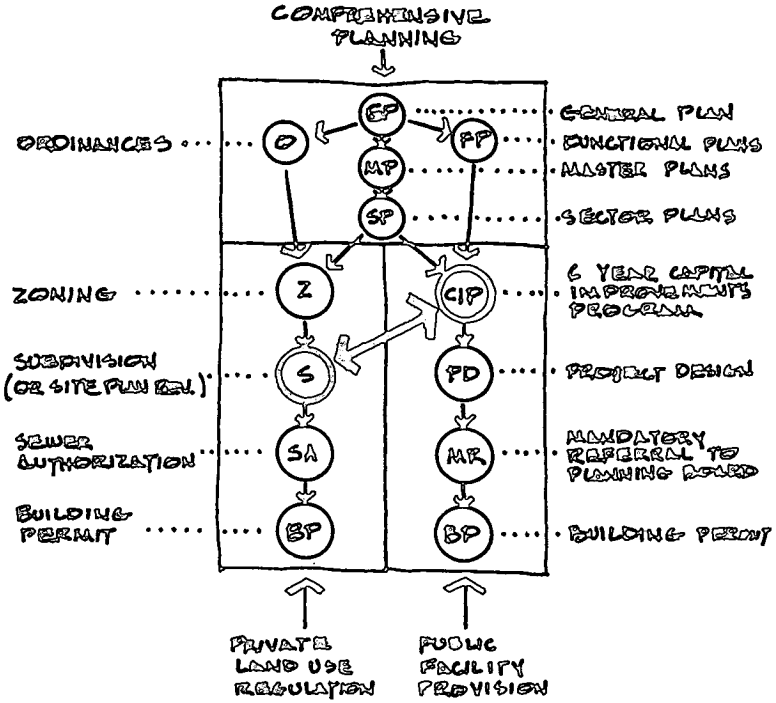

FIGURE 1-5

aggregate several pieces into one larger piece, it would not come under the APF test, since the latter only applies to parcels coming through the subdivision review process. At present, the site plan review process does not have any APF test associated with it. Thus, while a parcel that did not require subdividion approval could possibly come before the Board for site plan review, such review would not encompass the APF test.

Figure 1.5 also shows that the five major tools in the Comprehensive Planning Process (the General Plan, master plans, sector plans, ordinances, and functional plans) constitute an interlocking set of policy guidelines, that underlie both the process of private land use regulation and the process of public facilities provision. Montgomery County over the years has adopted plans that lay out an end state picture of a relationship between private development and public facilities. In this end-state picture, the private and public elements are, by definition, assumed to be in approximate balance with each other. However, since the attainment of this end state is many years away, the relevant issue during the intermediate period is one of timing.

Known as "staging" within the County, this issue has been addressed by several of the new generation of master plans and sector plans (e.g., Germantown, Bethesda, etc.); but there is at present no comprehensive staging plan that covers all areas of the County and all levels of detail. Because of the complexity involved, the development of such a County-wide staging plan is quite difficult.

Because of this difficulty the County's approach has been to apply the APF test to each parcel of land as it moves through the development process. Under this approach, each parcel must be measured against the state of the public facilities system at the time it comes up for review. To specify the relationship that will be measured, the APF Ordinance prescribes that the test for each parcel of land shall be to compare it to the full public facilities system already in place, together with all new public projects proposed for completion within the time frame of the six-year Capital Improvements Program (CIP). Figure 1.5 indicates this relationship with a line connecting the subdivision process to the CIP process. Within the context of the present County approach, the ability to measure and maintain the Carrying Capacity of the County becomes narrowed down to a focus on the method of measuring this interrelationship.

Adequate Public Facilities and Capital Programming

Figure 1.6 is useful for exploring some of the considerations necessary in measuring the APF connection between the individual parcel of land and the CIP. One of the first considerations is to recognize that we are measuring on top of an existing base, both of population and of public facilities. The APF Ordinance is a tool that measures at the margin of the existing mass of the urban fabric.

A second observation is to note that the amount of new private development added by a single parcel of land, unless it is a quite sizable parcel, tends to be a rather small increment compared to the existing mass. This is illustrated graphically by the depiction of a relatively smooth continuous line labelled "Private Population Need" in Figure 1.6. By contrast, it is generally true that public facility additions to the existing stock tend to come on line in much larger increments. As a generality, one new school accommodates considerably more than one new subdivision; similarly for police, fire and health clinics. A major arterial road or freeway can accommodate the traffic generated by many developments. And a really large sewer trunk line or rapid rail line can accommodate a very large area.

This leads to the third observation that the points in time at which a perfect balance is achieved between private population need and public facility capacity are relatively short in duration and somewhat far apart. What this means, of course, is that the measurement process must make allowance for these considerations and use statistics that reflect average relationships over time. The conclusion is that we must recognize the need to measure not only the absolute numbers involved, but also the relative numbers involved, and specifically allow for some tolerance and uncertainty within the mathematical operations.

Adequate Public Facilities Ordinance - Issue Number One

A thoughtful examination of Figure 1.6 suggests two areas in which the present APF administrative process is less than optimum, and in which changes for the better could be made. The first derives from examing the horizontal axis of the time dimension and the second derives from examing the vertical axis of the growth dimension.

In the time dimension, we see the same scale difference between the increment of change on the public side, and that on the private side, as we saw in the growth dimension. The gestation period for a private parcel of land from application for preliminary plan of subdivision, through construction, to occupancy permit tends to run approximately two to four years. By contrast, the gestation period for a "point" public facility, such as a school, possibly could be accomplished that fast, but tends to take a little longer; while the period for a major roadway or trunk sewer line is even longer and can range up to ten years or considerably more.

The present Subdivision Regulations divide the subdivision permit process into two parts: the first, an approval for a preliminary plan; and the second, the

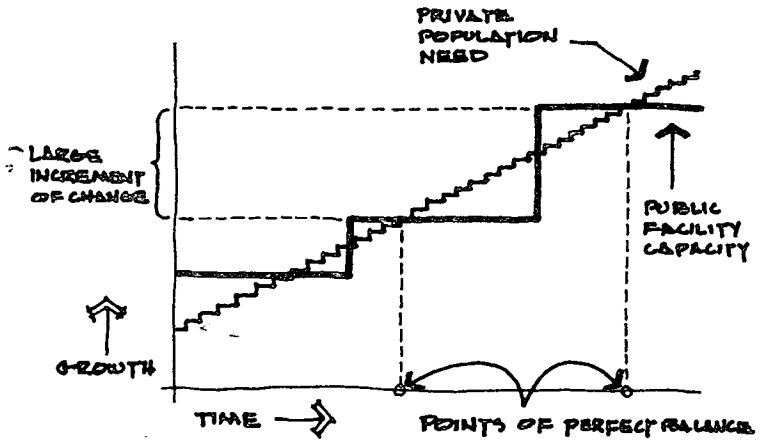

FIGURE 1 6

final approval of the record plat. By virtue of its own internal administrative regulations, the Sanitary Commission will not begin processing a private development project for sewer authorization until it has an approved preliminary plan. In order to comply with this requirement, and not penalize the private landowner, the Planning Board has adopted administrative policies by which it will approve a preliminary plan without a detailed APF test of the specific water and sewer transmission line capacity. This latter computation, since it frequently involves detailed engineering and cost considerations, is judged by the Sanitary Commission in its decision of whether to grant sewer authorization to the project or not. However, proof of sewer authorization must be presented to the Planning Board before the preliminary plan approval can be converted to a final record plat approval under the subdivision process. By contrast, with the water and sewer considerations, the test for APF on the other six APF categories in the Ordinance are performed by the Planning Board prior to granting preliminary plan approval (i.e., roads, transit, schools, police, fire, and health).

There is, however, another connection to a County-wide staging element that has not yet been mentioned specifically in this chapter. This is the Ten-Year Water and Sewerage Plan, under which the County is divided geographically into six areas with a time frame for the provision of water and sewer service attached to each. Categories 1, 2, and 3 provide for sewer service to be available within one to two years from the present; Category 4 provides for sewer service within the three to six year period; Category 5 provides for sewer service within the seven to ten year period; and Category 6 provides for no service within the first ten year period, and is indefinite with regard to the timing of sewer service beyond that time. The staging connection lies in the fact that the APF Ordinance requires a parcel of land to fall in either Category 1, 2, or 3, in order to be eligible to file a preliminary plan application.

Thus in the case of sewer, the County has a staging tool in the form of the Ten-Year Water and Sewerage Plan which acts as a screening device that comes into operation prior to the application of a parcel of land for preliminary plan approval. In its present state, however, this tool is rather crude and coarse grained, inasmuch as the vast majority of the land area shown within the ten-year sewer envelope aleady has been placed in Categories 1, 2, and 3.[3]

At the present time and for the recent past, there have been environmentally imposed moratoria on the amount of development that could be sewered within these categories. These constraints have derived from both a shortage of treatment plant capacity and, in some cases, specific transmission line inadequacies. While these additional sewer moratoria have acted as a prescreening device overlayed on top of, or prior to, Categories 1, 2 and 3 in the Water and Sewerage Plan, their effect on the geographic distribution of growth has been entirely haphazard, and unrelated to any other staging considerations that would derive from consideration of other facilities, such as those in the Transportation and Community elements.

Another staging element that is not specifically reflected in the growth management chart in Figure 1.5 is the Interim Sewer Service Policy. This policy derived from the County government's efforts to ameliorate the effects of the sewer moratoria imposed by the state and federal governments. It reserved certain shares of the available sewer capacity for different functional classes

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[3] See maps in Chapter IV showing areas designated for the six sewer service area categories

of building (i.e., small builders, moderate priced housing, commercial and industrial, health needs, etc.). During this past year, this policy has progressed to where it now requires developers to submit a five-year staging plan, stating their scheduled intention for build out. Sewer authorizations granted under this Interim Sewer Service Policy are subject to recapture by the Sanitary Commission if the developer does not adhere to the stated schedule.

Thus, the Interim Sewer Service Policy has introduced a staging tool that: not only overlays, or precedes, the screening device provided by Categories 1, 2, and 3 in the Ten-Year Water and Sewerage Plan, but also divides the sewer capacity into functional divisions, which relate to the perceived functional and fiscal needs of the County; and also incorporates a recapture provision to ensure the efficient use of the capacity available. The existence of these staging tools should be kept in mind while exploring the next relevant aspect of the timing issue.

The Subdivision Ordinance currently requires all approved preliminary plans that have not been converted to an approved record plat within one year from the date of their approval, to be resubmitted to the Planning Board for approval of extension for another year. In former years, this provision created no problem. Since the advent of the APF Ordinance, however, developers have begun to worry about losing a previously approved preliminary plan because of a subsequent change in the Capital Improvements Program.

The CIP is also evaluated and revised each year; and if there should be a fiscal squeeze, perhaps projects might be cut from the program, or delayed in completion. Since the developer has invested not only in the carrying costs of his land, but also in the engineering fees for the subdivision plans, as well as other engineering fees from which to obtain sewer authorization, strong feeling exists in the development community that a subsequent disapproval of a preliminary plan extension, on grounds that the CIP no longer would support the APF relationship, would be unfair. The Planning Board tends to agree with this perspective and feels that a desirable growth policy should aim for approximately equal commitments on both sides of the public/private staging process.

Recommended Amendment to the Adequate Public Facilities Ordinance

To improve this less than optimum aspect of the growth management system, the Board recommends that the Subdivision Ordinance be amended to provide that approved preliminary plans contain a schedule for development and have a life of three years.

A relative or proportionate adherence to the schedule could be used similar to that already established for the Interim Sewer Service Policy. If the schedule were being met and the project were not completed at the end of three years, the preliminary plan could be extended for an additional three years without a test of adequate public facilities. Otherwise, the subdivision would expire and an entirely new application would have to be filed and undergo a new adequate public facilities test. No subdivision should receive more than one extension without an APF test, unless it can be shown that the reason for failure to build is government imposed.

The three-year life span for an approved preliminary plan would have three advantages: (1) It would allow a reasonable period of "safe" time for the applicant to negotiate the rest of the approval process and complete record plat approval; (2) it would allow the County to obtain a more realistic assessment of its current public

facility needs, by virtue of clearing the air in the first year of those "paper" subdivisions that are not seriously proceeding and are consequently blocking the use of the available sewer capacity by others who do wish to proceed; and (3) although perhaps a quite marginal efficiency, it would eventually reduce somewhat the staff workload now required to process these several applications annually.

We believe that this proposal would improve the equity of the process and would remain within the acceptable limits of the APF measurement techniques referred to previously in connection with Figure 1.6. The present APF Ordinance does not require the measurement of the effect of the land parcel on interim years within the six-year period of the CIP. It simply requires measurement of the net marginal effect of the land parcel as developed, compared to the total network of existing and programmed facilities as they will exist at the end of the six-year program. If one accepts the public/private equity principle suggested above, the shift from a one-year life span to a three-year life span for an approved preliminary plan is inconsequential to the public/private staging balance.

Adequate Public Facilities Ordinance - Issue Number Two

A focus on APF tests at time of subdivision leads into consideration of the second aspect of the present growth management process that is less than optimum. This has to do with the geographic scale at which the APF measurement is conducted.

Some citizens have argued that the Planning Board is in error in its current practice of counting only previously approved, but not yet built, record plats in addition to the particular parcel of land under scrutiny for APF preliminary plan approval. They have argued that all previously approved preliminary plans, that have not yet proceeded to record plat, should also be measured in the computation. They suggest that otherwise the computation will err on the side of underestimating the private population need in comparision to the capacity of the public facility.

The Planning Board is not convinced that this argument is strong enough to suggest any change in current practice, because of the tolerance levels necessary (as depicted in Figure 1.6), and also because of the possibility of court intervention, if such a shift were attempted.[4] A parcel of land moved through the development review process to the point of record plat represents a considerably greater investment, and one on which larger taxes are paid annually, as well as a much stronger commitment to build, than does a preliminary plan. To deny a particular developer a preliminary plan approval on the grounds that the public facility capacity has been used up by a previously approved preliminary plan would at least be subject to legal scrutiny, because the record indicates that not all approved preliminary plans proceed to record plat. For these reasons, the Board believes it wise to continue with its current practice for the time being.

However, the issue of measuring just the incremental effect of a single land parcel is deserving of further consideration. Experience indicates that there are statistical difficulties in precisely relating the effect of the need generated by a single parcel of land against the capacity of a large-scale public facility system. This relative scale problem is rendered more difficult, the more integrated is the public facilities system. The easier it is to distribute the load over the entire system, the easier it is to absorb a small additional amount at

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[4] Persons interested in this point may refer to the various relevant past opinions of the Maryland courts.

the edge. This is true for both the point facilities, such as schools, and for the network facilities, such as roads and sewers.

What is necessary for a proper analysis, is to identify the location of the critical points within each of the systems, and the threshold capacity above which that critical point is subject to excess stress or failure. To do this latter analysis is a complex task under any circumstances, but is rendered more difficult the finer the grain at which it is attempted. Since the parcel-by-parcel approach of the APF Ordinance requires a very fine grain of analysis, the logical question is whether there may not be a better way to measure the APF effect at a larger scale and coarser grain, one that would put less strain on the integrity of the analytic techniques required and provide a more rational and effective basis for public actions to manage growth.

Recommended Amendment to Growth Management Approach

Having examined this problem in detail, the Planning Board concludes that an alternative approach to the present APF Ordinance probably would be more efficient and better understood in the long run. Such an alternative approach would retain the APF concept as an integral part of the growth management system, but would simply shift its point of application from a total reliance on the preliminary plan application, to a much stronger reliance on the staging provisions of the Ten-Year Water and Sewerage Plan.

The process would work as follows. The present APF Ordinance would remain in effect for all preliminary plans on septic tanks or other small separate waste treatment systems, whether inside or outside the ten-year sewer envelope. A County-wide staging element of the General Plan would be developed that would establish growth thresholds for subareas of the County within the ten-year sewer envelope. These growth thresholds would be established by a planning judgment that derived from an analysis of all the public facility systems as reflected in the six-year CIP.

This County-wide staging element of the General Plan would be prepared by the Planning Board and presented for public scrutiny and formal adoption. Once adopted, these growth thresholds would be incorporated by amendment into the Ten-Year Water and Sewerage Plan. This, in turn, would guide the Sanitary Commission in its process of releasing sewer authorization to approved preliminary plans on a first-come, first-served basis, within each subarea of the County, up to the limit of the subarea's established threshold capacity.

Developers would be aware of the threshold capacities in each subarea, but could file preliminary plan applications regardless of the number of other previously approved preliminary plans in that area. They would know, however, that their prospect of receiving sewer authorization in an over-subscribed area would depend on some of those ahead of them dropping out. On the other hand, the existence of a known list of outstanding preliminary plan applications could also be used by County government as an indicator of need for additional public facility expansion; and the CIP could be amended to shift fiscal resources to those areas where the accumulating need was greatest. The threshold ceilings of the subareas could be keyed to the provision of specific capital projects and a cyclical planning and evaluation process introduced, by which to better relate the forecasting of growth needs to the programming of public facilities.

CAPITAL PROGRAMMING AND FORECASTING

Figure 1.7 graphically portrays some relationships among future time periods that are important to the planning process. All planning and programming must

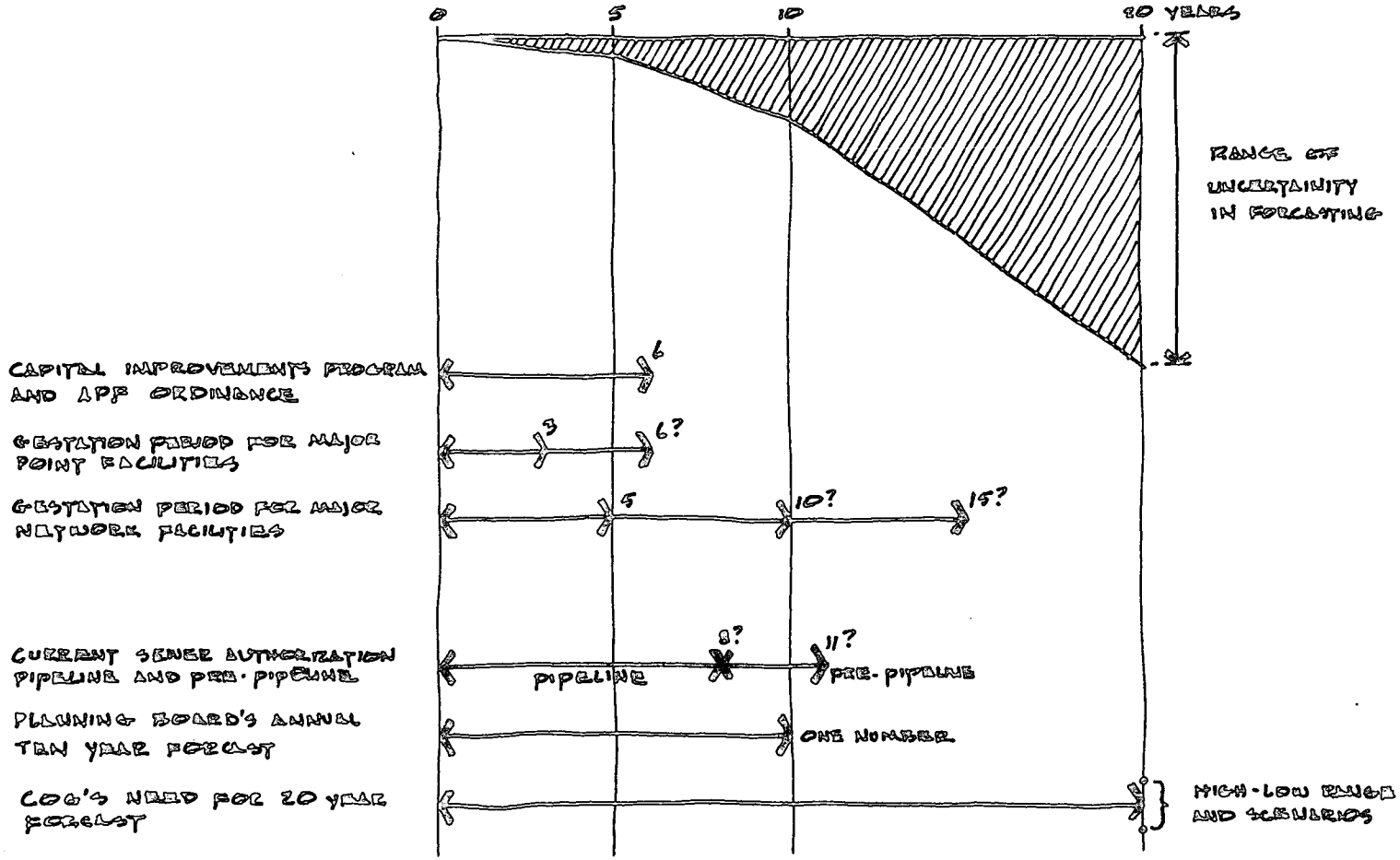
0
5
10
20 YEARS
RANGE OF UNCERTAINITY IN FORCASTING
CAPITAL IMPROVEMENTS PROGRAM AND APF ORDINANCE
6
GESTATION PERIOD FOR MAJOR POINT FACILITIES
3
6?
GESTATION PERIOD FOR MAJOR NETWORK FACILITIES
5
10?
15?
CURRENT SEWER AUTHORIZATION PIPELINE AND PRE-PIPELINE
8?
11?
PIPELINE
PRE-PIPELINE
PLANNING BOARD'S ANNUAL TEN YEAR FORECAST
ONE NUMBER
COG'S NEED FOR 20 YEAR FORECAST
HIGH-LOW RANGE AND SCENARIOS

FIGURE 1-7

construct a picture of the world at some future in time and use this forecast as the basis from which to develop plans and strategies. Several terms of art are commonly used to describe this process. "Forecasting" means an effort to predict as accurately as possible the growth and change which will occur in the County in the future. This process is governed by rules of logic, and it makes certain assumptions about further behavior patterns. Another term often used is "end state." An end state is simply the urban geographic pattern that accompanies a forecast and is assumed to be in effect at the end of the forecast period. Another term, "scenario" is a description of a series of events that occur sequentially from the present into the future, and that logically result in the forecast and its resultant end state. With these terms in mind, Figure 1.7 provides some insight that is useful for understanding and improving the growth management system.

The top portion of Figure 1.7 represents the limitations of the human mind in dealing with the human future. In the physical sciences, some phenomena are known to be subject to quantifiable laws, and thus can be predicted accurately for long periods ahead. In the social sciences, however, no such laws have been proven, and the range of uncertainty associated with a forecast increases geometically as the distance in time from the present increases. In the specific activity known as "urban growth forecasting," relatively little systematic research has been documented. It is our opinion that, barring unforeseen major events, such as wars or natural disasters, a relatively accurate forecast can be made for about five years into the future, that the second five-year period becomes increasingly hazy and subject to error, but is still sufficiently within the bounds of reasonable probability to justify the exercise. Beyond ten years, however, and certainly by the end of the twenty-year period, the range of uncertaintly has increased enormously, because of the innumerable number of possible changes in human behavior that could occur during this time frame.

One facet of this problem not shown in Figure 1.7 is the size of the geographical unit for which the forecast is made. As is the case with all statistical phenomena, the larger the universe of data, the greater the accuracy associated with statistical measurements of it; and, conversely, the smaller the universe of data, the lower the accuracy associated with the results. Applying this mathematical principle to the graph of increasing uncertainty over time produces a simple conclusion. Twenty-year forecasts for small areas have an exceedingly high uncertainty factor produced by the compounding effect of enlarging the time period and diminishing the size of the area.

The above analysis is relevant to the problem of measuring the APF capacity of the County. To measure the public/private balance at a future time, we must use the end state picture at that time. When we reach too far into the future, we exceed our grasp on choosing the most realistic scenario, and are left without a single best forecast from which to derive a single best end state with which to test the APF balance. The process of producing master plans has traditionally ignored this staging problem by dealing with an end-state relationship between its public and private elements that assumed the complete build-out of the plan, and thus was independent of a time dimension. Implicit in such plans was the notion that the human behavior patterns assumed during the plan production will remain constant over whatever time frame is necessary to build out the plan. In Montgomery County, the uncertainty problem has been dealt with by incorporating into the master planning process an expressed policy intention to revise these plans within a six- to ten-year cycle.

In spite of this uncertainty problem in forecasting, the

second part of Figure 1.7 tends to simplify the problem insofar as a relationship between forecasting and capital programming is concerned. At the present time, both the Capital Improvements Program, and the APF Ordinance based on it, are limited to a six-year reach. Also, the gestation period, from inception to completion, for most major point facilities, tends to be from three to six years. A similar time frame attaches to the smaller branch and twig projects in the network systems of transportation and water/sewer. It is only the major branch and trunk components of these two network systems that require gestation periods of ten years and longer.

This is not to say that no significant public costs or efficiencies are associated with longer planning periods for point facilities and minor branch network elements. Obviously, land costs may rise to prohibitive levels if no advance land acquisition or reservation is carried out. But, all things considered, it seems reasonable to establish the ten-year forecast period as being that which is far enough into the future to adequately plan for all public facilities, with the exception of major network branch and trunk elements, and yet not so far into the future that it totally exceeds the power of the human mind to create scenarios and evaluate end states.

What this suggests for the planning process is represented by the third and lower portion of Figure 1.7. The Planning Board will continue to produce an annual ten-year forecast by subareas of the County, which establishes a single number for each area as being the most probable. In the process of arriving at this forecast and end state description, the Board's staff may develop alternative scenarios, both high and low, in terms of total volume, and also with possible alternate geographic distributions. But a single "best guess" or "most probable" forecast will be produced.

This general, all-purpose forecast will represent a sincere effort at predicting the actual course of the future under the assumptions about human behavior that are explicitly acknowledged. Also specifically acknowledged will be the fact that the most probable ten-year-away number for each forecast area[5] has a probable range of error of plus or minus 15 percent or more; and that the probable range of error increases sharply as the size of the cell, or geographical area, decreases below that of the forecast area.

Beyond the ten-year period it is our feeling that a single all-purpose end state forecast is not an efficient planning tool. At twenty years and beyond, the problem is best dealth with by inventing alternative scenarios that produce significantly different high and low volume end state pictures, and significatly different alternative geographic distributions for each of the high and low volume projections. These scenarios should be tailored to test their impact on the particular branch or trunk network element for which a public investment decision is required, and related to the relative system, as well as to the degree of investment risk involved in either under- or over-estimating the real need. The logic and rationale behind this approach should be carried by the County representatives into the Council of Governments' procedures at appropriate times and places.

Figure 1.7 illuminates one other significant element that could be used to impove the relationship between forecasting and capital programming. This is shown by the arrow labelled "Current Sewer Authorization Pipeline." The length of this arrow in years is derived by comparing the total number of dwelling units that could be built on all the land parcels that have thus far

[5] See Chapter 2 for maps and a more detailed description.

received sewer authorization, to the rate of growth[6] anticipated by the current ten-year forecast. The relationship of this pipeline to the growth rate and time frame is explored in detail in Chapter 3, below. The point to be made at present is, that the greater the number of stated intentions by developers, the less uncertainty in developing the ten-year forecast. An arrow in Figure 1.7 has been added to show th effect of adding the so-called "pre-pipeline," referring to the number of dwelling units possible under the outstanding approved preliminary plans that have not yet received sewer authorization. The relative proportions of these arrows simply highlights the observation made in the preceding section, that a cyclical process of growth policy staging could use the pipeline and pre-pipeline inventory to advantage in monitoring and amending the Capital Improvements Program. Of course, a judgment always must be made as to whether the cumulative amount of the builders intentions can really be supported by the market as fast as the builders estimate, bearing in mind that, until the cumulative list is published by Government, the developers do not know how much competition they will face.

Forecasting and Growth Management - The biological sciences seem to have demonstrated that nearly all living organisms follow a normal growth rate curve that appears, when graphed, as an "S" shaped curve (see Figure 1.8). By contrast, abnormal or exponential growth takes place at an ever-accelerating rate tending to continue until some essential internal relationship is shattered by stress, at which point the total growth phenomenon drops off very sharply before resuming again slowly, or possibly not at all. The relevant analogy for urban growth management is the "S" curve

6 i.e., intermediate growth rate as described in 1975 Growth Policy Report, Forecast; people, jobs and Housing.

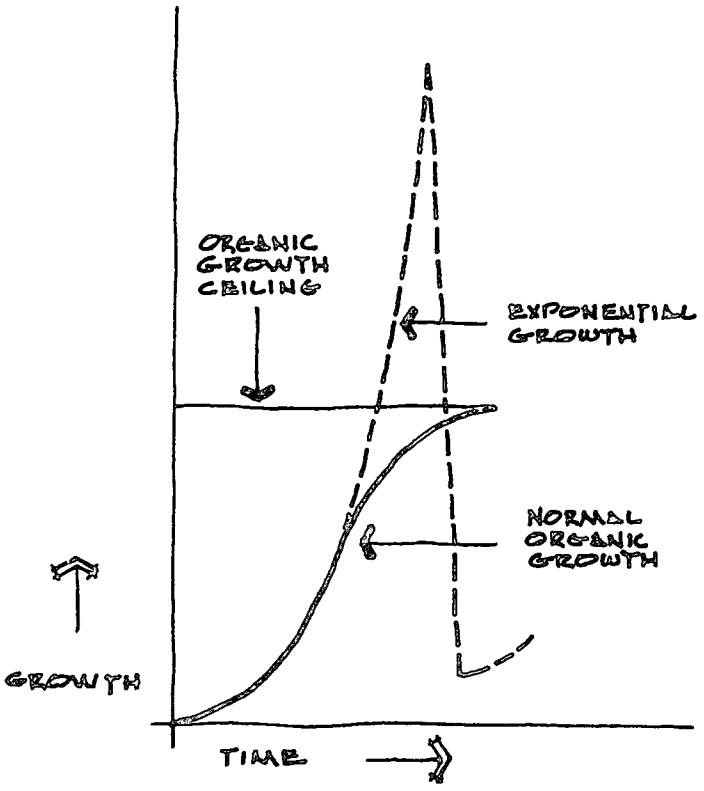

FIGURE 1-8

relationship between the normal organic growth curve and the levelling off threshold of full maturity.

Translated into urban terms, this analogy suggests that if a municipality establishes a growth ceiling that is reasonably related to the actual carrying capacity of the area, then the actual growth rate experienced will tend to level off in an "S" curve as it approaches the established ceiling. Viewed from another perspective, this analogy could state that if a growth ceiling is clearly established, and buttressed not only by strong and consistent policy actions but also by the internal logic of the carrying capacity relationships, then there will be induced a certain friction that will tend to slow down the growth rate as it comes closer to the ceiling.

At the present time, the Planning Board staff attempts to take this assumed phenomenon into account to a certain extent. Some commentary on this point is contained in Chapter IV, which examines the residual holding capacity of the County as measured by the most recent vacant land inventory. The question of what constitutes a carrying capacity ceiling is an intriguing one, that in the real world must be established through legislative judgment, backed up by solid technical analysis and proper administrative due process. The County's sector plan for Friendship Heights demonstrated both attributes and, accordingly, was sustained by the Maryland Court of Appeals.

Figure 1.9 illustrates that the carrying capacity ceiling of an area may be expressed in terms of a number of different constraints that pertain to different points along the planning development spectrum of the growth management system (compare Figure 1.5). Within Montgomery County's planning and growth management system, the highest capacity ceiling is that of the General Plan. Since it is without specific quantitative measures, this plan provides a somewhat flexible carrying capacity ceiling that can be generally inferred from the maps and text, but which was not intended to be a precise constraint.

At a level below this is a second holding capacity, consisting of the capacity of all the adopted master plans, as reflected in the proposed zoning maps contained within them, together with the holding capacity of the existing zoning in the areas for which no master plans have yet been adopted. This capacity ceiling is more definitive than that of the General Plan. But it is still a somewhat unrealistic ceiling in terms of its influence on present expectations inasmuch as it requires future zoning map amendments by the County Council before the plans can be implemented.

The next lower ceiling level is the actual capacity of the existing zoning on the ground. This level is lower than that of the master plan zoning because several of the adopted plans do have staging elements in them, which provide for the rezoning of land to higher densities only after certain public facilities have been completed (cf, Germantown).

As mentioned earlier above, the ten-year sewer envelope provides a staging overlay or prescreening device that lowers the effective holding capacity at a given point in time to that for which sewer authorization can be provided. Similarly, the Interim Sewer Service Policy, because of the environmental moratoria on sewer treatment and transmission capacity, constitutes an effective ceiling lower than that of the ten-year sewer envelope.

Figure 1.9 shows two dashed lines labelled "Possible Intermediate APF Thresholds." These are shown in this way, not to suggest that they would be lower in total capacity than the Interim Sewer Service Policy, but to illustrate that threshold ceilings based on compre-

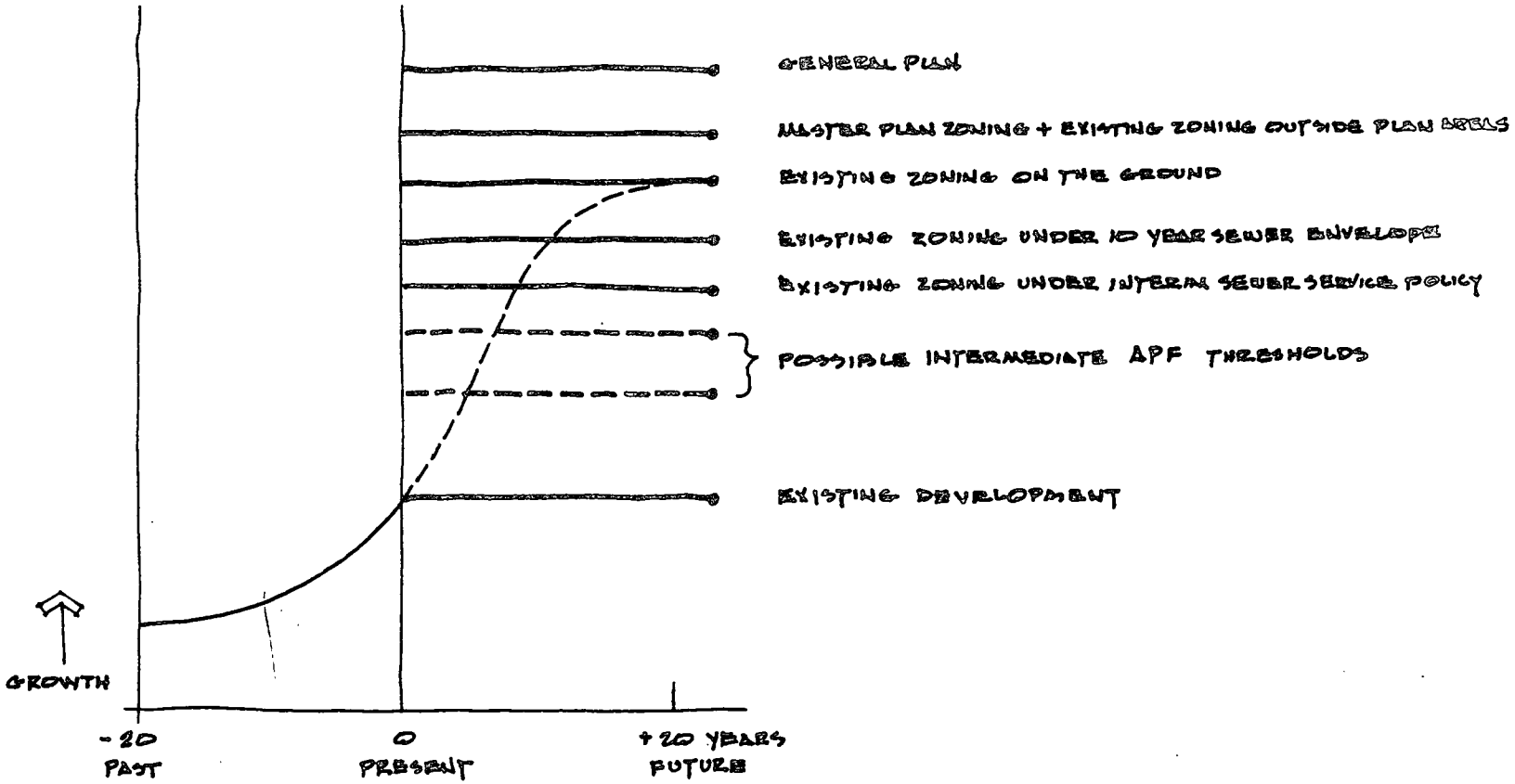
GENERAL PLAN
MASTER PLAN ZONING + EXISTING ZONING OUTSIDE PLAN AREAS
EXISTING ZONING ON THE GROUND
EXISTING ZONING UNDER 10 YEAR SEWER ENVELOPE
EXISTING ZONING UNDER INTERIM SEWER SERVICE POLICY
POSSIBLE INTERMEDIATE APF THRESHOLDS
EXISTING DEVELOPMENT
GROWTH
-20
PAST
0
PRESENT
+20 YEARS
FUTURE

FIGURE 1-9

hensive APF analysis theoretically could be developed at intermediate levels between existing development and master plan zoning. The difference between such intermediate APF thresholds and the ceilings of the Interim Sewer Service Policy, and ten-year sewer envelope, would lie in their being derived from an analysis of the total public facility capacity, and not just that of the sewer system.

A movement in this direction has been initiated in Prince George's County, where the new draft General Plan Amendment suggests two intermediate County-wide growth thresholds prior to reaching full capacity. In Prince George's County, these intermediate thresholds are suggested to be keyed to the timing of a number of new sewage treatment plants along the Patuxent River. In Montgomery County, the geographic drainage is primarily all to the Potomac River, which because of the water intakes along it, does not lend itself to the placement of a series of treatment plants at the foot of each major drainage basin. While staging thresholds might ultimately be developed in Montgomery County based on incremental sewage treatment plant additions, they are less likely to be geographically discreet in a manner similar to that in Prince George's County.

By constrast with Prince George's County, transportation is a more serious constraint in Montgomery County, because Montgomery's smaller section of the suburban circumferential ring, together with its General Plan, combine to create a serious traffic congestion problem that brings traffic analysis into a key role in growth management. In Montgomery County, it appears as if transportation access will become the key factor once the current sewer moratoria are lifted. Under these circumstances, the value of some intermediate APF thresholds that derive from a total public facility analysis, rather than just sewer, may become more evident as times goes on.

On the other hand, the question may be raised as to whether any intermediate thresholds are necessary between the existing developmental level and that possible under the end state zoning of the adopted master plans. The answer to this question must, of necessity, fall in the area of policy making because it relates directly to the quality of life, in terms of levels of public service, that will be experienced by the citizens of the County during the intermediate period. Figure 1.10 helps illustrate this point.

Figure 1.10 portrays several possible future scenarios. All of them assume the establishment of a County carrying capacity ceiling which, for the purposes of this illustration, could be that of the current adopted master plans or any other. It also assumes that the normal growth in private population would follow an "S" curve as shown by the curve marked "Private Population Growth--Alternative No. 1." The scenarios are as follows. All of them assume that there are no intermediate growth thresholds established between the present and the end state some time in the future.

If the balance between private and public that exists at the present were to be maintained throughout the growth period, then the curve for public facility growth would be the same as that for population growth as is indicated by "Public Facility Growth--Alternate No. 1." Under these circumstances, the quality of life as expressed in the surrogate APF measure called "level of public service" remains the same.

However, if the rate of private population growth increases more rapidly as shown on "Private Population Growth--Alternate No. 2," at the same time that public facility growth stays on its normal curve as shown in "Public Facility Growth--Alternate No. 1," then there

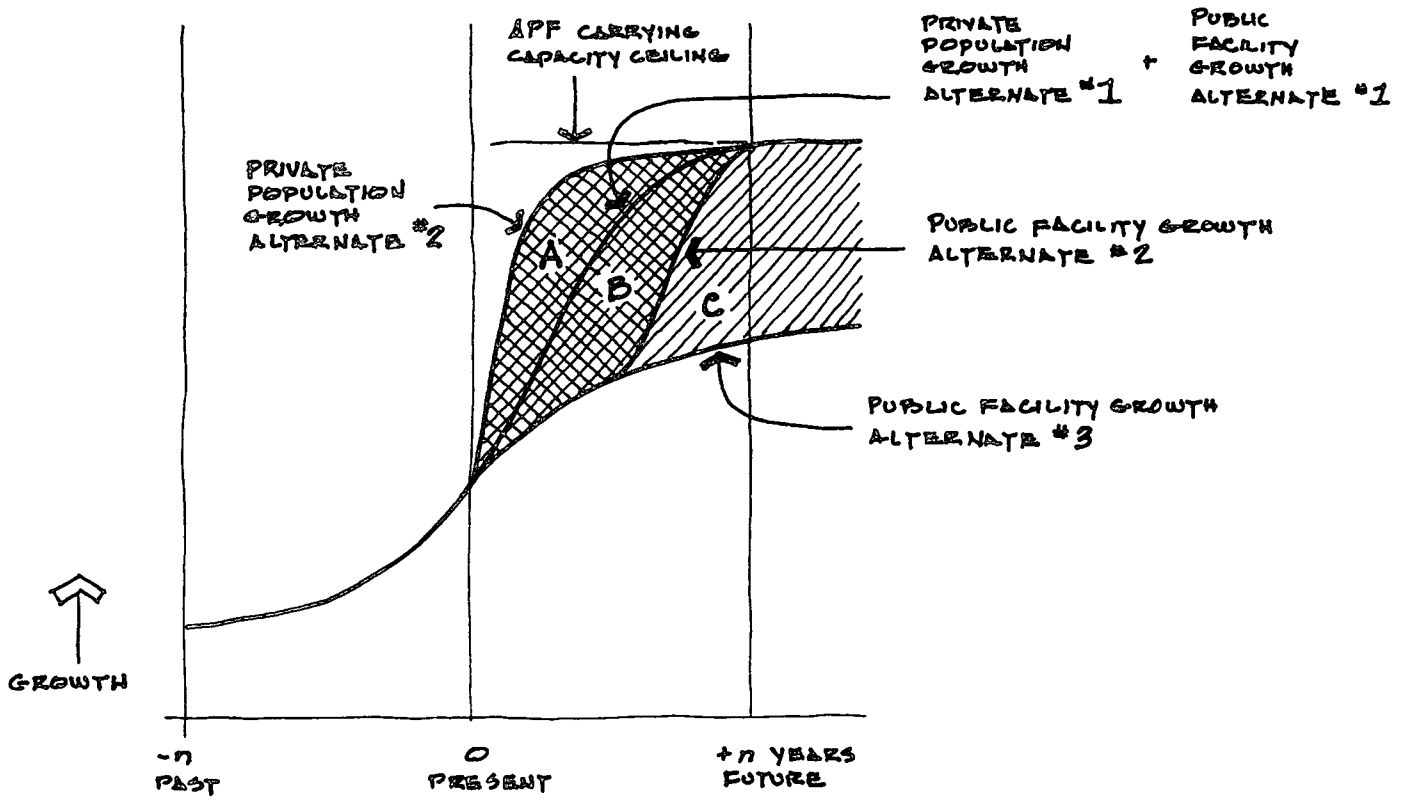
APF CARRYING CAPACITY CEILING
PRIVATE POPULATION GROWTH ALTERNATE #1
+
PUBLIC FACILITY GROWTH ALTERNATE #1
PRIVATE POPULATION GROWTH ALTERNATE #2
PUBLIC FACILITY GROWTH ALTERNATE #2
PUBLIC FACILITY GROWTH ALTERNATE #3
A
B
C
GROWTH
-n PAST
0 PRESENT
+n YEARS FUTURE

FIGURE 1-10

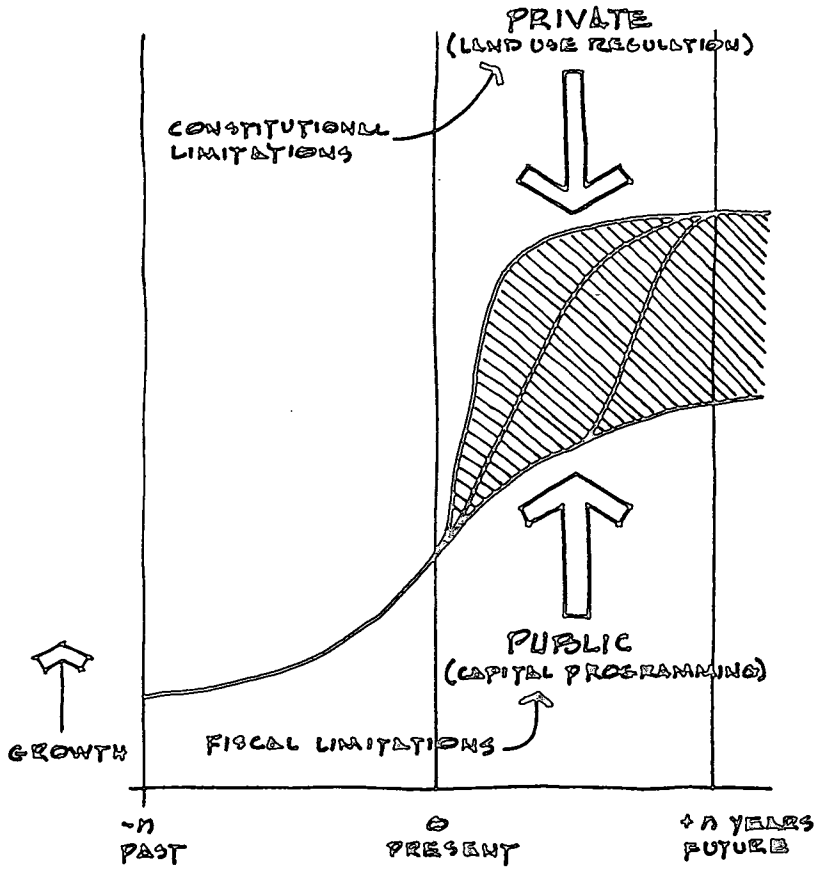

FIGURE 1-11

will be a lowering of the average level of service during this period. This reduction in level of service will begin gradually and worsen up to a certain point, after which it will begin to gradually improve until the status quo is reached at the end of the growth period. Area "A" represents the amount of the shortfall in the level of service under this scenario.

Another scenario would be "Private Population Growth--Alternate No. 1" compared to "Public Facility Growth--Alternate No. 2." In this scenario, private growth stays on a normal course, but public facility programming lags behind, and only catches up at the end of the growth period. This produces a phenomenon similar to that mentioned above, with the shortfall in level of service illustrated by the area labelled "B."

An exacerbation of the same effect would be the combination of "Private Population Growth--Alternate No. 2" and "Public Facility Growth--Alternate No. 2."

And, finally, there is the possibility that public facility growth would never catch up with private population growth. Graphically, this would compare either "Private Population Growth--Alternate No. 1" or "2" with "Public Facility Growth-- Alternate No. 3," leaving a shortfall in level of service, represented by either area "B" plus area "C;" or area "A" plus "B" plus "C."

Figure 1.11 completes the list of illustrations that seek to explain the relationship between forecasting and growth management. Figure 1.11 diagrams the objective of a growth management system as reflected in the two arrows, one pressing down and one pressing up, in an effort to reduce the potential shortfall in the level of public service and the overall quality of life.[7]

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[7] Figures 10 and 11 ignore the "lumpiness" in public facility growth curves shown in Figure 6, only in order to simplify the abstract diagram.

Referring back to the growth management system illlustrated in Figure 1.5, we can relate the top arrow to the private land use regulation side of the process, and the bottom area to the public facility provision or capital programming side of the process. If public facilities begin to lag behind a normal growth rate, more money and commitment will be needed to maintain the level of service. On the other hand, if private growth begins to exceed the normal growth rate, then land use regulation constraints may need to be imposed to maintain balance in the level of service.

Both of these tools are limited in the amount of force that can be brought to bear to squeeze the shortfall in the level of service. These limitations were explored in the 1974 and 1975 growth policy reports and will not be further detailed herein. What is new in this year's report is a focus on three issues:

1. How well can this relationship between public and and private growth be within the state of the art of APF measurement technology?

2. Assuming it can be measured well, how large and how long a future shortfall in the current level of service would be acceptable within the policies of the County government?

3. How effectively can the two levers of growth management (i.e., public and private) be coupled together to squeeze any future shortfall in the level of service into the policy-established acceptable range?

Conclusion

The preceeding sections of this chapter have outlined a narrative argument that seeks to weave together the separate concepts of carrying capacity, adequate public facilities, capital programming, and forecasting, into the single strand of a comprehensive growth management system. In the process, we have recommended:

1. an amendment to the present Adequate Public Facilities Ordinance to extend the life of an approved preliminary subdivision plan from one year to three years, with a possible additional three-year extension, provided the developer furnishes evidence of having substantially complied with the staging plan he submitted with his original preliminary plan application; and

2. a potential improvement in the application of the Adequate Public Facilities concept by shifting its focus from the Subdivision Ordinance to a County-wide staging element of the General Plan that could be translated into implementation through the Ten-Year Water and Sewerage Plan and, subsequently, into the other steps in the development process.

The legal staff of the Commission has examined both of these recommendations and determined that both were feasible and justifiable within the statutes of the County and the State.

In addition to these recommendations, the argument has been brought up to the point of identifying two additional issues; namely,

1. How accurately can we measure "level of service" among various public facilities?

2. How close a staging "fit" is necessary or desirable over time?

3. How can the twin levers of private land use

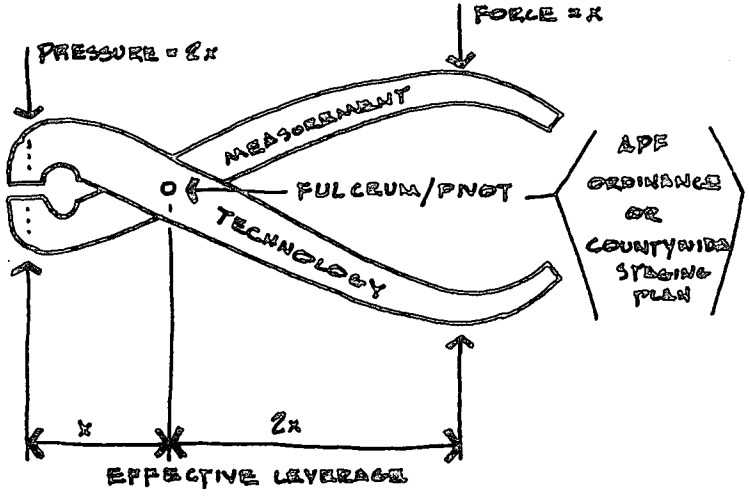

FIGURE 1-12

regulation and public facility programming be coupled together to best achieve the "fit" that the County's policy sets as a goal?

This report cannot provide a definitive recommendation on these two issues, but it does provide a conceptual base and the information base upon which a well-informed decision can be made. Figure 1.12 together with the remaining chapters of this report help to illuminate this conclusion. Figure 1.12 takes the analogy of the need for a nutcracker force applied simultaneously above and below, to squeeze the private and public growth rates so that they stay close together, and diagrams this concept in the form of a pair of pliers.

Two elements are necessary for a pair of pliers to exert force efficiently. One is a fulcrum/pivot bar that is strong enough to withstand the opposing forces coming from both directions; and the other is a handle length sufficiently long to allow the principles of mechanical leverage to operate, and thereby reduce the amount of force required to manipulate the tool. If by analogy the two opposing teeth of the pliers are the public and private implementation processes diagrammed in Figures 1.5 and 1.11, then the fulcrum/pivot bar that must withstand the full weight of the opposing forces may be characterized as constituting either the APF Ordinance in its present form, or alternatively a County-wide staging plan, if the concept outlined in this report were to be pursued.

Earlier portions of this chapter have argued, in effect, that the relative leverage of measurement technology afforded by the APF Ordinance is significantly less than might be achieved by working at the County-wide scale. Under this hypothesis, a growth managment system that used a County-wide staging plan as its fulcrum/pivot would be easier to operate, or, alternatively, could

provide greater effective power through improved leverage than would a system that used an APF Ordinance for its fulcrum pivot.

A County-wide staging plan based on a comprehensive Adequate Public Facilities assessment could be developed within approximately one year from the present. This goal now appears achievable because of the completion within the last month or so of several important and necessary monitoring and modeling tools. These tools, together with the completion of a few more that could be brought on line within the next year, offer the promise of being able to systematically cross-reference and integrate the future condition of the various public facility systems to a greater extent than has been possible in the past. In particular, we are referring to:

1. a new computerized system for mapping and calculating the capacity of the vacant and redevelopable land in the County (see Chapter IV);

2. a computerized water and sewerage monitoring and simulation system, currently used by the Sanitary Commission only for accounting purposes, but which could be expanded to simulate future conditions (see Chapter V);

3. a new roadway intersection, level of service, inventory of the County, and a new and more detailed traffic modeling technique, that permits the simulation of traffic onto a road network at a grain fine enough to correlate closely with the highway capital program (see Chapter VI);

4. a computerized demographic model with which to forecast the changes in age characteristics by subareas of the County, which information can then be used to more effectively analyze the future needs for various community point facilities, such as schools, and possibly others such as health clinics, etc.[8] (see Chapter VII); and

5. a computerized fiscal accounting system developed for the 1975 growth policy report, which has subsequently been refined and updated with respect to its assessable base parameters and could be further applied to the analysis of a County-wide staging plan.

The following chapters of this report elaborate on the theme of this chapter by representing the results of various detailed technical measurements and forecasts. Chapter II is presented for approval by the County Council as the general purpose ten-year forecast to 1987, as well as for approval of the basic approach to be followed in the next round of cooperative forecasting for the twenty-year time frame at the Council of Governments. Chapter III through VII constitute a demonstration project of the kind of technical analysis and measurement that could be performed more thoroughly and for a greater number of alternative end states during the next year.

Action Recommendations

On the basis of the above line of reasoning, the Planning Board recommends that the County Council concur in the following four specific actions:

1. That the County Council approve the ten-

[8] Refer to recently completed Park, Recreation and Open Space Master Plan, Phase I, for a pilot demonstration of the application of this technique.

year forecast as outlined in Chapter II of this report as the County's official general purpose forecast, and concur in the approach outlined for developing twenty-year forecasts in conjunction with the Council of Governments' Cooperative Forecasting Process, with the understanding that checkpoint meetings between Planning Board staff and County Council will and other relevant County agencies be held at the Council's convenience during the process of alternative scenario construction in the COG Cooperative Forecasting Process.[9]

2. That the Planning Board prepare an amendment to the Adequate Public Facilities Ordinance for County Council Public Hearing and adoption that would provide for approved preliminary plans to have a life span of three years before resubmission for Board approval and possible extension for a second three-year period, provided that the developer has carried out construction in substantial compliance with the staging plan submitted at the time of initial subdivision approval.

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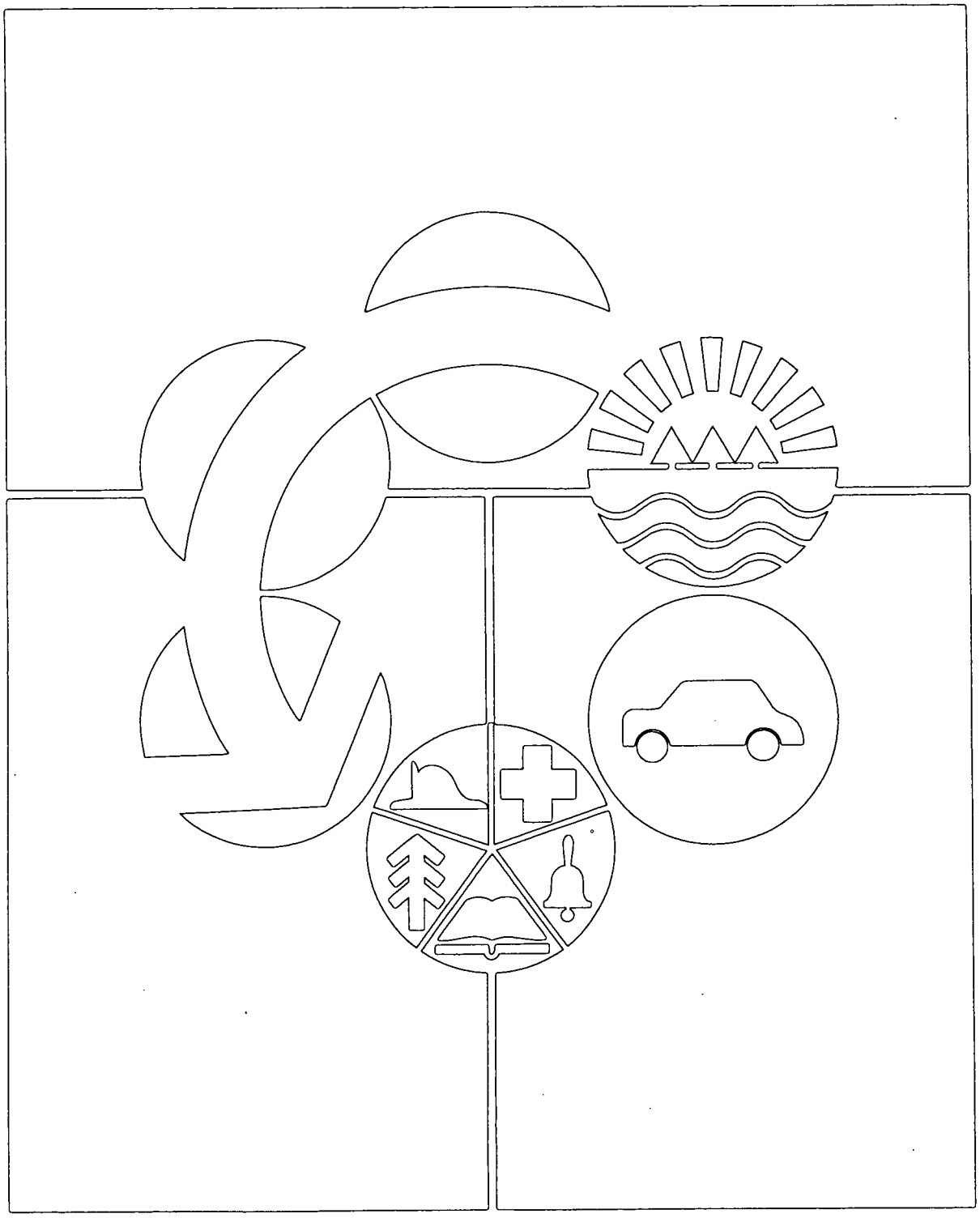
9 It should be noted that Planning Board staff convened a meeting in September of a Technical Advisory Panel composed of representatives of the County government, the State of Maryland, the City of Rockville, the City of Gaithersburg, and others and that this panel unanimously accepted the ten-year forecast and twenty-year cooperative forecasting approach outlined in Chapter II.

3. That the Planning Board shall with the Washington Suburban Sanitary Commission, the Board of Education, and the relevant agencies or departments of County government develop the component elements of growth management accounting system in such a way that the monitoring accounts of each agency are compatible with, and complementary to, those of all the other agencies.

4. That the Planning Board produce the next County growth policy report in early December, 1978, in order that it may be available for use by the incoming County government when it takes office in January, 1979; and include in this growth policy report a set of detailed proposals showing how the capacities and staging of the transportation, environment and community facility systems could be brought into harmony with each other, and related to a desirable growth rate for the County, within the context of a County-wide staging plan.

5. That the County Council use the "pipeline" impact assessment details presented in Chapters III through VII of this report as a reference guide to decision making during the forthcoming capital programming and budget session and direct the Planning staff to make such additional technical studies as the Council may feel desirable and practical within the time available.



Chapter Two

FORECAST: 1977-87 & BEYOND

CHAPTER II

FORECAST: 1977-1987 AND BEYOND

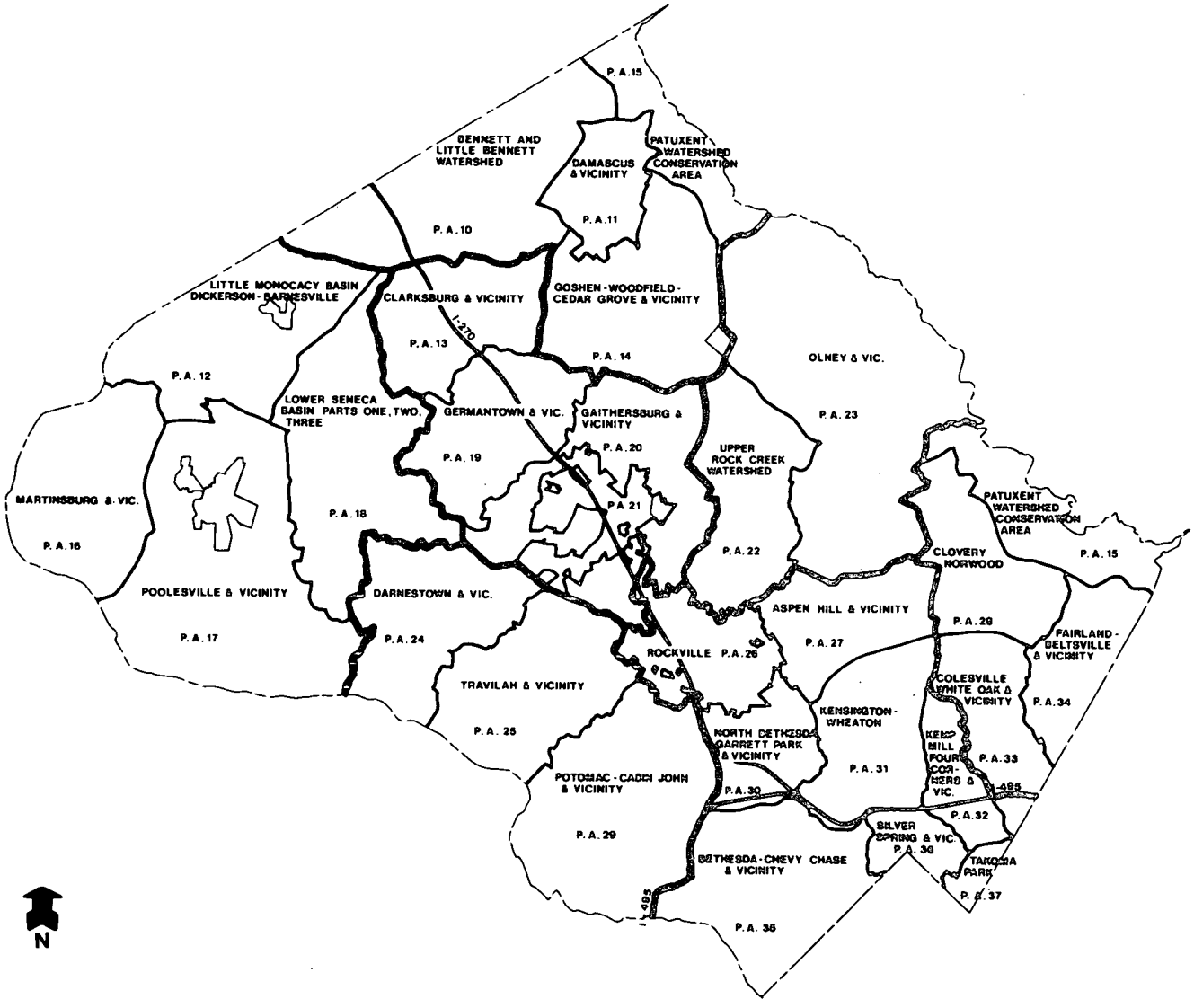
SUMMARY
An analysis of current trends and a proposed ten-year forecast for population, employment and housing is made. Data sources and methodology are listed and their contents explained. A different approach for forecasting beyond the ten-year period is proposed.

At this date there is insufficient evidence to revise the trend of household population and employment growth that was presented in the 1976-1986 Forecast. County development indicators are being closely monitored, but there is nothing which differs significantly from the trends analyzed to produce last year's forecast. The Demographic Model remains available as a forecasting tool, and will be updated with data from the 1977 Census Update when it becomes available over the course of the coming year.

For the period beyond ten years, two alternative growth scenarios already have been developed from which to derive 1995 projections. The lower growth scenario is effectively an extenion of the ten-year forecast which, in turn, is a continuation of current trends in the housing market. The high growth scenario is an extension of the County's high growth rate as witnessed in the late 1960's and early 1970's.

It is proposed to use these two scenarios as the base from which other alternative long range scenarios shall be developed during the next round of COG's Cooperative Forecasting process, with the understanding that checkpoint meetings between Planning Board staff and County Council and other relevant County agencies will be held at the Council's convenience during the process of alternative scenario construction at COG.

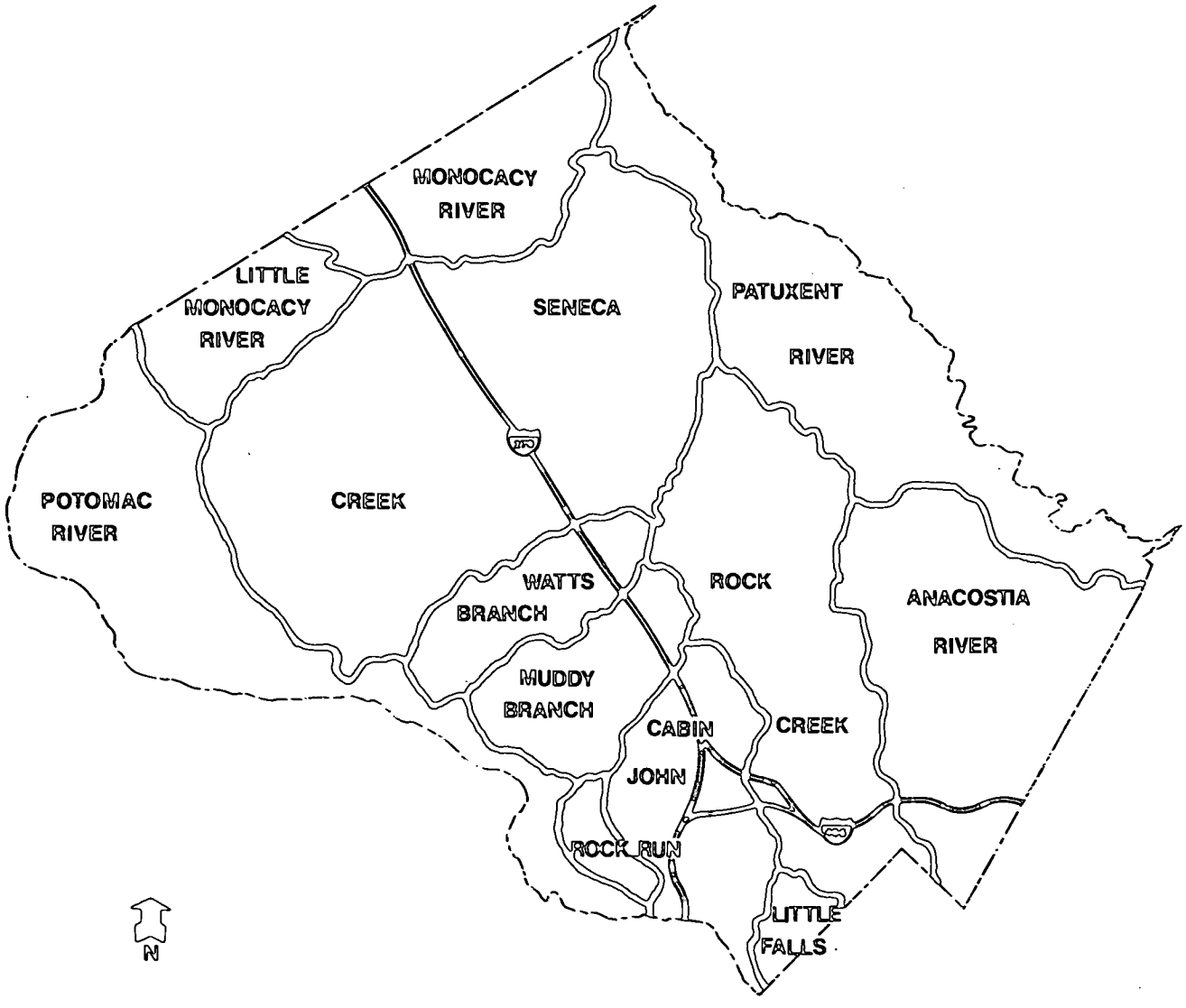
GROWTH FORECAST AREAS & PLANNING AREAS IN MONTGOMERY COUNTY



SOURCE : M-NCPPC
TEN YEAR WATER PLAN

FIGURE 2.1

MAJOR DRAINAGE BASINS, MONTGOMERY COUNTY



SOURCE : M - NCPPC
TEN YEAR WATER AND SEWARAGE PLAN

FIGURE 2.2

CONTINUATION OF THE 1976-1986 "INTERMEDIATE" RATE

After a thorough analysis of current market trends and development indicators, the Planning Board staff has concluded that the forecast trend for the 1976-1986 period is also appropriate for the 1977-1987 period. The 1976-1986 Forecast was a major revision over previous forecasts, and we do not believe that present information warrants the publication of a new forecast for the 1977-1987 period. This decision was prompted by several considerations. First, we have only just begun to analyze the results of our 1977 Census Update Survey. While preliminary results indicate that there have been no major changes in demographic trends since the last survey in 1974, we prefer to thoroughly study this material before publishing a new forecast. Second, our staff is involved in a second round of the Council of Governments' Cooperative Forecasting Process. This region-wide effort will produce new revised forecasts for each member jurisdiction by early summer of 1978. We would like to take full advantage of our participation in this process before publishing a new forecast.

Sewer service availability will not be a constraint upon forecast growth for the first five-year period. Prior sewer authorizations, various consortia plants, and ISSP commitments are more than sufficient for the amount of growth forecast for this five-year period. Although additional sewer service capacity will be needed for the amount of development projected for the second five-year period, it is assumed herein that such capacity will be available in one form or another. (See Chapter V.)

HOW TO UPDATE THE FORECAST FOR THE 1977-1987 PERIOD

Figure 2.3 illustrates how the extension of the growth rate used in the 1976-1986 Forecast is extrapolated to produce population, employment and housing estimates for the year 1987 of, respectively, 693,400 persons, 341,500 jobs, and 254,700 dwelling units. With the exception of those new numbers for 1987, and one other exception outlined below, the estimates for the intervening years from 1976 to 1986 will continue to be the same as produced in last year's Growth Policy report,[1] and reference should be made to that document for a description of the methodology and technical detail.

The one other exception that must be noted is a change in the base year population figure for 1976. This change is necessary because an improved method of estimating the current year's poplation has produced what we believe is a more accurate count than the methodology used last year. This new technique is outlined in Appendix 1 of this Chapter. The effect of this improvement is to reduce last year's estimate of the actual population base in 1976 from 590,000 to 582,800. Under this same technique our current estimate for actual 1977 population is 584,000.

This change is statistically too small to have any effect on the rate of growth that is forecast for the next decade. Its only effect is to reduce the 1976 base year estimate by 7,200 persons, and, to be consistent, to reduce each of the succeeding year's estimates in the forecast by the same amount. Thus, in case anyone wishes to cite a precise population estimate, the total County population numbers shown in the Tables in last year's report, should be reduced by 7,200 persons in each succeeding year.

Because this amount of change (i.e., 7,200 in 590,000) is only 1.2% of the total, and is well under the margin of error associated with the entire art of population estimation, we felt that it was not worth paying the

[1] Forecast: People, Jobs & Housing; Third Annual Growth Policy Report of the Montgomery County Planning Board, October, 1976.

ILLUSTRATION OF TECHNIQUES FOR EXTENSION OF 1976 - 1986 FORECASTS TO 1987

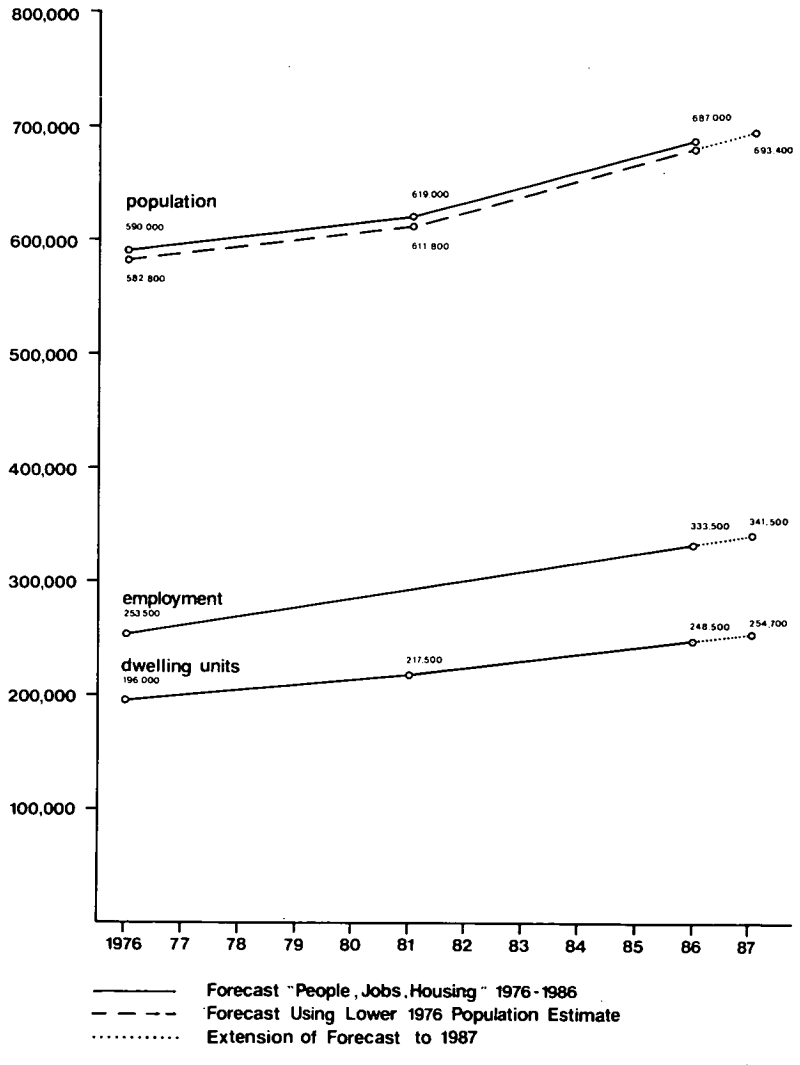


FIGURE 2-3

cost of reprinting all the Tables used in last year's report. A further reason for not reprinting them is that this change applies only to population, and not to the employment and dwelling unit estimates. A change of this magnitude is explainable strictly within the variation in family size and labor force participation rates that are constantly occurring; and does not, therefore, imply any shift in the dwelling unit estimate or the employment estimate.

COG COOPERATIVE FORECASTS

The Board of Directors of the Washington Council of Governments approved a set of projections for its member jurisdictions in September, 1976. These projections were the result of a Cooperative Forecasting Process which began in September, 1975.[2]

Early in the process the Montgomery County Planning Board staff submitted two sets of forecasts. A "trend" or high forecast, which was based upon a continuation of the historically high growth period from 1965-1974; and a lower or "intermediate" forecast, which represented a continuation of the most recent growth trends and which was selected as the most probable growth rate in the Board's 1976 Forecast: People, Jobs, and Housing. Because of limitations on time, and on the resources available to other COG member jurisdictions, only one forecase was adopted by COG for each jurisdiction. The intermediate forecast was recommended for Montgomery County because it was judged to be "most likely." However, it is the opinion of the staff of the Montgomery County Planning Board that a range should be used for projections beyond ten years, such as the COG projections which extend to 1995. (See Chapter I.)

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[2] The process and methodology is described in the third annual Forecast: People, Jobs, and Housing.

We make an analogy between the forecasting process and a flashlight shining into a great abyss. The area nearest the start of the forecast is more certain than the remainder of the period as the power of the Forecast declines with the distance in time it travels from its origin. We feel that our five-year forecast is most reliable since we can made use of current trends and development pipeline information on sewer commitments, subdivisions, etc. The uncertainty surrounding the ten-year forecast can most likely be attributed to a timing error. For example, growth projected for the tenth year might actually occur in the seventh or the thirteenth year.

However, projections beyond ten years should consider different views or scenarios of the future. Such a process recognizes the need for a risk assessment judgment of the various investment alternatives that are open to the government. This will usually come down to a comparison of the costs of building a facility with excess capacity and lower-than-anticipated revenue, versus the cost of having to add onto a facility at some later date. It is our position that all member jurisdictions should follow this approach for the second round of cooperative forecasting.

COMPARISON OF SCENARIOS--TRENDS AND INTERMEDIATE GROWTH RATES, 1975-1995, SUBMITTED TO THE WASHINGTON COUNCIL OF GOVERNMENTS IN ROUND ONE OF COOPERATIVE FORECASTS

High Growth Rate Scenario ("Trend")

This projection, when first outlined in the 1975 Growth Policy report, assumed that 70,000 new dwelling units could be completed with a population increase of 150,000 by 1985. This is somewhat less than the number that was completed during the ten-year period from 1965-1974 (72,370). After examining past cyclical changes in construction rates, current economic conditions, projections of an acceleration in labor force participation, and household formation caused by an increase in young adults within the latter part of the decade, it also assumed that the growth rate would be greater in the second five-year period than in the first. (The trend growth rate projects an average yearly increase of 6,400 dwelling units with 11,000 population for the first five years and 7,600 dwelling units with 19,000 population per year for the second five-year period.) Current development activity in the County indicates a lower growth rate than this will probably prevail, at least for the next ten years. The Planning Board's current ten-year forecast, which is the focus of the Forecast: People, Jobs, and Housing report of 1976, recommends this lower forecast through 1986. (See below.)

The trend growth rate scenario assumed that single-family units (including townhouses) would retain their mid1970's share of the market during the ten-year period--(i.e., approximately 54 percent). However, the current softening of multi-family demand and market supply problems would likely lead to a single-family share of close to 60 percent for the first five-year period. After 1980, a significant recovery in the multi-family housing market was assumed to levels associated with the early 1970's.

Lower Growth Rate Scenario ("Intermediate")

Continuing review of economic and other growth parameters over the past few years, led to the development of a separate set of assumptions for projecting a lower growth rate than the past trend. This second growth rate is called "intermediate growth." From a statistical standpoint, its development was much more difficult than the trend since it cannot be structured by using time series data. The extrapolation of past trend lines, such as for housing construction rates, employment growth, etc., form the basis for the Trend forecast.

But, the Intermediate projections must be structured more on professional judgment concerning the future impact of very recently observed changes in growth indicators, such as the severe dropoff in the local and regional housing market since 1974. Such indicators include: a marked slowing in metropolitan growth in the Washington area, with higher growth rates in the outer counties including Howard, Frederick, and Anne Arundel; a slowing in the rate of federal employment growth in this region; a declining national population trend with particular application to the northeast region to which the Washington metropolitan area is related; and the high costs of constructing and financing housing, especially apartments.

A lower rate of multi-family development, 18,000 versus 32,000, accounts for 14,000 or 70 percent of the difference in dwelling unit growth between the intermediate and trend growth rates over the first decade. The lower rate of growth would have the greatest impact on the down-county areas. Approximately 50 percent of the difference in multi-family development between the two growth rates would occur in Silver Spring, North Bethesda, Bethesda, and Rockville. This is because most of the growth projected in the Trend for these down-county areas is assumed to occur near Metro stations on high-density land. Eighty-five percent of the difference in total dwelling units would occur in planning areas below the I-270 Corridor. In the intermediate projection, growth in the I-270 Corridor shifts toward a greater proportion of single-family units with one-third less growth occurring by 1980. However, slightly more growth is projected for the second five-year period; and since there are more single-family units than in the Trend, total population growth for the ten-year period is essentially the same as in the trend.

The Intermediate growth rate assumes that Metro will have only a minimal impact on residential construction; the opposite was assumed for the Trend alternative. The Trend assumes that Metro will encourage the development of approximately 10,000 multi-family units in the down-county planning areas between 1980 and 1985. Both alternatives assume very little down-county multi-family growth during the period 1975-1980 due to sewer constraints and the unfavorable conditions for high-density apartment development. The Trend assumes that the apartment market will be centered down-county during 1980-1985 and, therefore, the I-270 Corridor will receive a proportionate decline in multi-family development during this period. The Intermediate projection assumes only a minimal increase in down-county development during the 1980-1985 period; therefore, the I-270 Corridor is expected to maintain its share of the multi-family development.

1985-1995 PROJECTIONS

Both the trend and intermediate forecasts were "extended" from 1985 to 1995 using statistical regression analysis. A statistical curve was developed which related past data, and our projections to 1985, to growth in national households. Using projections of national households, the regressions produced forecasts for 1990 and 1995 which were consistent with trend and intermediate forecasts for the 1975-1985 periods. This methodology needs to be amended in favor of other techniques for developing 1995 or year 2000 scenarios, such as alternative possible shares of the regional total, etc., and will be undertaken during the rest of 1977 and 1978 in conjunction with the COG Cooperative Forecasting Process. Checkpoint meetings between Planning Board staff and other relevant County agencies will be held at Council's convenience during this period.

APPENDIX 1 - ADMINISTRATIVE RECORDS APPROACH FOR ESTIMATING CURRENT POPULATION

A different methodology has been developed to obtain current estimates of the County's total population. Essentially, this is an administrative records approach. The records are those of (1) the Board of Education, (2) State Motor Vehicle Administration, (3) the Social Security Administration, and (4) the births recorded during the previous five-year period. Each of these agencies has information specifically for the County. The Board of Education has records of the school-age population. The Motor Vehicle Administration is capable of reporting on the number of licensed drivers within age cohorts. Medicare and Medicaid records indicate the changes in the elderly population, supplemented by driver license data and information on federal retirees.

The combination of these records creates a composite picture of the County which is timely. Each source focuses on a different segment of population. Care is taken so that edges of each source do not overlap. A record is used up to a certain cohort and then another source is used above or in combination. For example, as people age past 65, they are less likely to renew their driver's license than younger people. At this point, the methodology calls for switching from drivers' licenses as a sole source of data to information on Medicare enrollment and federal retirees. The population aged 5-17 is estimated from school enrollment records. The children under 5 years of age are determined by adjusting the number of births which occurred during the previous 5 years, taking into account migration.

Straight addition of administrative records will not cover the entire population; e.g., not every adult has a driver's license. This methodology assumes that the ratio of those people covered by these records (by age, sex cohorts) has remained constant since the 1970 census. For example, if the number of male licensed drivers age 25 to 30 represented 98 percent of the total number of men in that age group in 1970, it was assumed that the same proportion holds true today. The number of women in the 25 to 30 age group is determined from census data by applying a male/female ratio to the male estimate. This methodology differs from the previous estimating procedures of the Commission, which relied upon estimates of the number of households and average household size. The U.S. Census Bureau has found that local population estimates made on the basis of dwelling unit inventories tend to be high. This is true principally because of overestimating the occupied dwelling unit stock. Demolitions tend to be ignored, and vacancy rates are generally underestimated.

The U.S. Census Bureau uses information taken from federal income tax returns to make its local area estimates between census years. This source is unavailable to the Commission. Just recently, the 1975 State income tax returns were analyzed by the County Department of Finance. As a source for demographic data, the reporting delay is substantial. The new methodology yields a similar trend to the previous method but lower absolute numbers. The administrative records approach produces estimates substantially similar to those of the U.S. Census Bureau, and it has the advantage of being more timely. For example, driver license data for January, 1977, was available in March, 1977.

APPENDIX 2 - PLANNING INFORMATION SYSTEMS

The third annual Growth Policy:--People, Jobs, and Housing (page 20) describes the information systems which aid the staff in making forecasts. During the past year, the Montgomery County Planning Board has added several elements to its computer systems. These elements include the following:

Existing Zoning Capacity - This information is created by applying factors which indicate average levels of development per zoning category to parcels which are included on the parcel file. Chapter IV discusses some initial results from this file.

Proposed Zoning Capacity - This special file takes information from the adopted master plans and applies proposed zoning categories to all vacant parcels. A special subsystem to this file is being developed which will estimate the potential planned redevelopment capacity of blocks in central business districts and transit station areas.

Vacant Land Inventory - This file is abstracted from parcel file data and includes private land which is considered to have potential development capacity. In general, this includes land with either no improvement value or improvement value less than land value and farm assessed land. This data can be portrayed using either the Synergistic Mapping System (SYMAP) or Multi-Scale Data Analysis Mapping Program (MSDAMP). The normal procedure would be to indicate geographic areas which have a user-determined percentage of vacant land. However, the MSDAMP system can portray the actual location of 500 large parcels of vacant land which have been specially coded into the system.

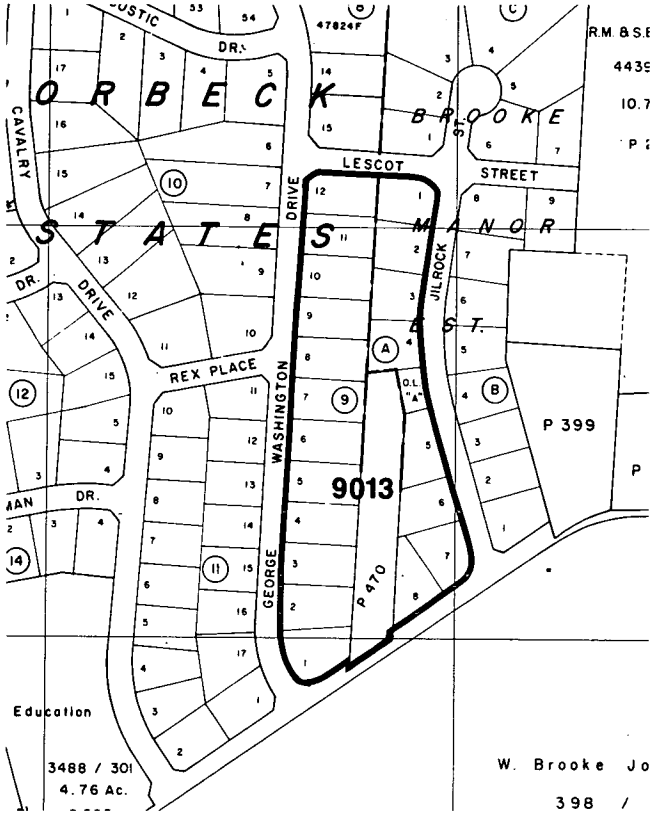
Computer Mapping Systems - The Montgomery County Planning Board uses two computer mapping systems--SYMAP and MSDAMP. SYMAP is primarily designed for the pattern display of one data unit; for example, housing prices. The system is especially useful for producing contour maps (lines are produced by joining points of uniform value). Maps with geographic boundaries can also be produced. Our basic geographic unit for this system is the DIA which readily converts to planning areas, drainage basins, and census tracts.

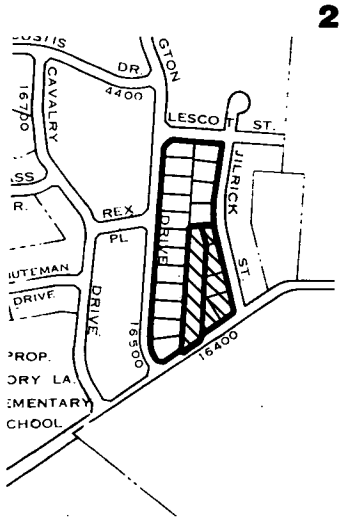
The MSDAMP system processes and maps information in cell format. The basic cell size is five seconds or approximately 4.5 acres.

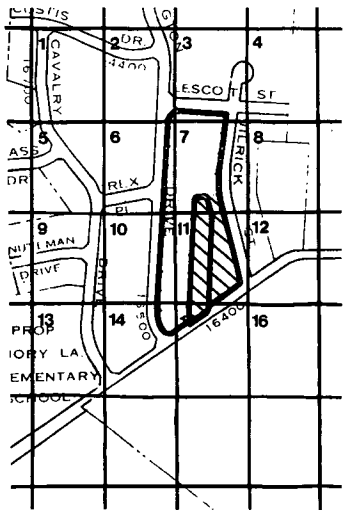
In Chapter IV the basic source of the data being displayed by the MSDAMP System is the Montgomery County Parcel File. Each parcel of land in the County has a record indicating its location (in terms of census tract and block), assessed value, zoning and other data. For the purposes of mapping, this data is accumulated to the block level. The block then has the characteristics of all its parcels. If the map is displaying all blocks which contain 25 percent or more of vacant land, the entire block would be shown even though some of the parcels may be completely developed. The precision of the display is to a 4.5-acre grid. Those blocks are assigned to grids based upon where the majority of the area of a block falls. Each block in the County is displayed by at least one grid cell, but often the block is represented by more than one cell.

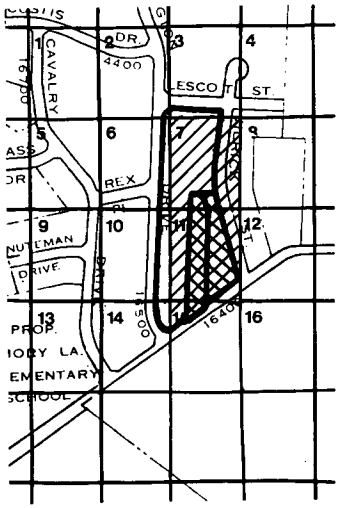
Take tract 13.01 block 9014 as an example. This is a regularly shaped block in Norbeck Estates. The block is circumscribed by Lescot Street, Jilrock Street, Emory Lane, and George Washington Drive. This particular block is made up of 22 parcels. Suppose parcel 470 and the area to the east, parcels A, 5, 6, 7 and 8, are vacant. This would mean that more than 25 percent of the land area of the block is vacant. If this were the display criterion, the entire block would be displayed,

MSDAMP Mapping Technique With Parcel File Data









N

SOURCE: M-NCPPC

FIGURE 2-4

both grid number 7 and 11. The data from the block, which in this case is the percentage of vacant land, is associated with the grids which make up the entire block.

Although the 4.5-acre grid is the smallest area which can be displayed, the block is the smallest area for data. In our sample block, the underlying reality indicates that most of the vacant land is in grid 9. The map, however, would show grid 6 as also having at least 25 percent vacant land. The information displayed is designed to show the characteristics of the underlying census block and not those particular parcels which underlie the grid cell.

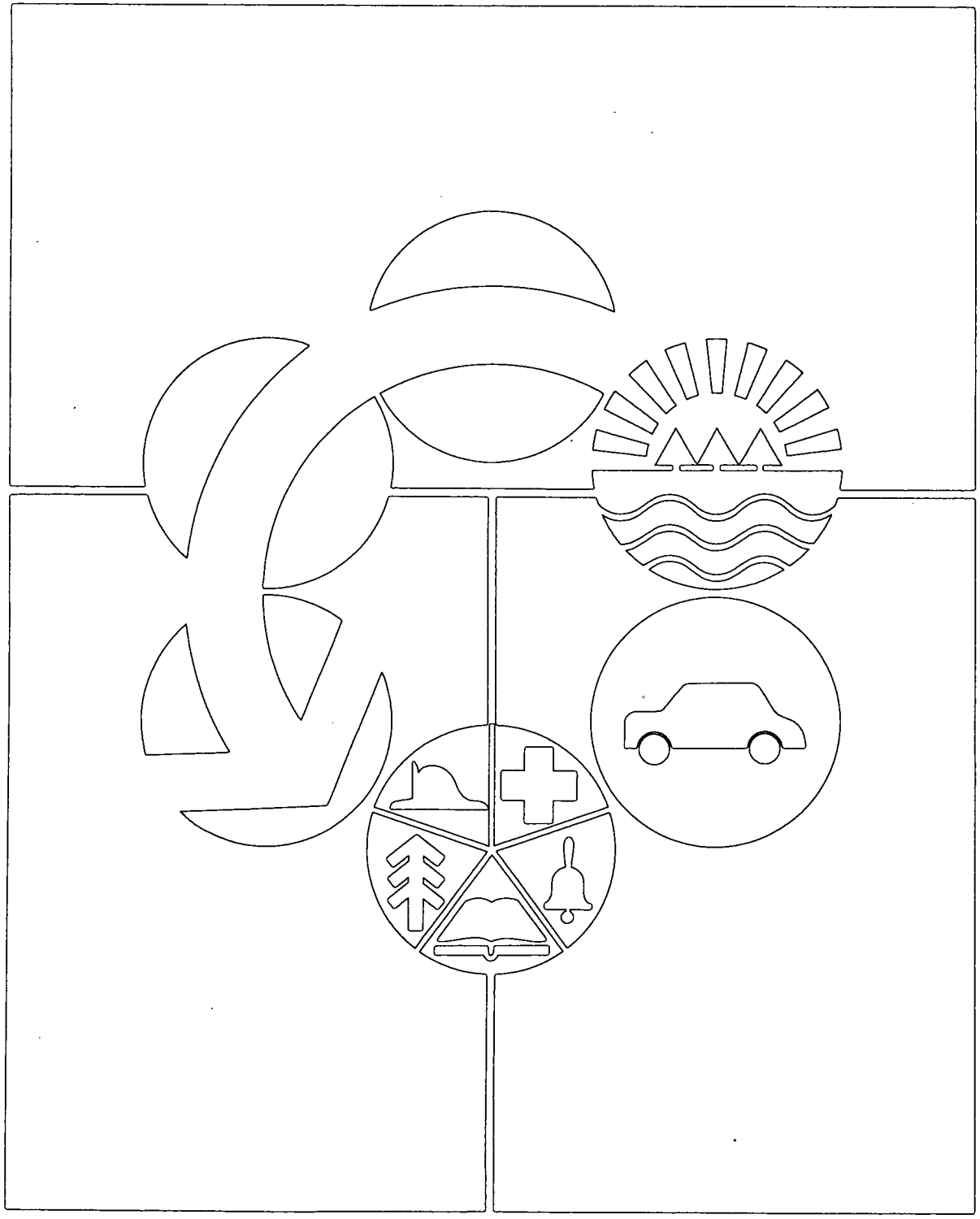
In the rural areas where the census blocks are rather large, sometimes several hundred acres, a more precise method is used to avoid gross inaccuracies. Parcels of land which contain over 100 acres are used as a pseudo block. Instead of accumulating the characteristics of parcels within a block, in this instance, the large parcels are treated as if they were blocks. This avoids the use of generalized data over large areas and permits a display of the actual characteristics of these large parcels. There are 500 parcels dealt with in this manner.

Maps 2, 3, and 4 in Figure 2.4, illustrating this mapping procedure, are actual segments of the map series used to assign census blocks to grid locations. The scale of these maps are 1 foot to 1,000 feet. The large MSDAMP displays are on a scale of 1 foot to 4,000 feet.

At this scale, for example, the grid shown on maps 3 and 4 is reduced in size to where one grid square is represented by one printed character. Our sample block, which in reality is something over nine acres, shows up on the 1- to 4,000-scale maps as two printed characters. These two characters would comprise a rectangle 1/4 of an inch high and 3/16 of an inch wide.

Conversion files are being developed to transform all socio-economic geographic area data at the Census Tract Block (CTB) size or greater into five-second cells. Thus, parcel file data is first aggregated to CTBs and then displayed by MSDAMP according to the number of five-second cells which correspond to the CTB locations. Natural systems data is recorded directly at the cell level and, therefore, requires no future aggregation.

MSDAMP is a flexible tool that permits the mapping of information as a single factor or as combination maps. The program user can select and mix different input and output scales and special symbology and can subjectively assign various weights to individual factors.



Chapter Three

The DEVELOPMENT "PIPELINE" & "PRE-PIPELINE"

CHAPTER III

THE DEVELOPMENT "PIPELINE" AND "PRE-PIPELINE"

SUMMARY

The development "pipeline" and "pre-pipeline" are defined in this chapter. The method of arriving at the pipeline total and geographic location is also described. Detailed tables show sewer allocation for the various ongoing programs. A brief comparison between the development "pipeline" and the ten-year Forecast is made.

The development "pipeline" is defined as the sum of all past and present WSSC approvals for sewer service, including previously approved but still outstanding commitments, the allocations under the Interim Sewer Service Policy (ISSP), the Rock Creek Consortium, and the various private sewer plants, as well as a staff estimate of probable construction on septic tank systems for the period 1977-87, which is the time frame roughly equated with the build-out schedule of the "pipeline" total. The total of the development "pipeline" is approximately 42,800 dwelling units. The geographic allocation of the development "pipeline" is similar to the ten-year Forecast, although the total amount in the "pipeline" is somewhat lower than in the Forecast. The development "pipeline" numbers are the basic inputs to the impact assessment in Chapters IV, V, VI, and VII.

DEFINING DEVELOPMENT "PIPELINE" AND "PRE-PIPELINE"

Virtually all residential development in Montgomery County goes through a process of official review and permits as it proceeds from the early planning stages through construction and completion. Ordinarily, it is as much art as it is science to determine how much of the development being proposed in a preliminary plan of subdivision will actually be constructed. Under normal circumstances, a significant proportion of the total dwelling units possible under approved preliminary plans will not be built for one reason or another, or will be considerably delayed. However, in recent years, sewer constraints in the County have forced developers to apply for the right to hook into the sewer system (also referred to as a sewer commitment) well in advance of their application for a building permit.

In order to evaluate the effect on the County if all of these sewer applications were, infact, built as planned, the staff has collected and analyzed these applications under two short-hand descriptions: (1) the "pipeline," and (2) the "pre-pipeline." The pipeline includes all residential construction plans which have been granted the right to sewer by action of the Washington Suburban Sanitary Commission, whether into private treatment plants or into the public system. It also includes a staff estimate of those units that will be built on septic systems within the next ten years. The latter was included in the definition in order to "round-out" the pipeline definition so that it could be used in the impact assessment process outlined in Chapters IV through VII.

Those developers with approved preliminary plans, who have applied to WSSC for sewer, but have thus far not been approved because of sewer constraints, are deemed to be in the pre-pipeline stage. The pre-pipeline development is not being analyzed in this report, but it represents the number of additional dwelling units which developers have said they wish to build in the near future.

SOURCE OF SEWER COMMITMENTS

The right to a sewer hook-up is approved through a number of programs undertaken by WSSC and private developers. In some cases, commitments can be purchased through "consortium" plants, whereby the developers finance treatment facilities which will then be turned over to WSSC.

The Rock Creek Consortium received approval by the County Council to proceed with construction of a 3.0 million gallons per day (mgd) interim sewerage treatment plant. The facility is presently under construction in the vicinity of Gude Drive and Southlawn Lane. Table 3.2 shows the approved application list dated July, 1977. However, as with the Interim Sewer Service Policy (ISSP), the Rock Creek Consortium dwelling unit totals by planning area will vary if developers leave the consortium and their commitments are sold to other developers.

The ISSP currently permits the approval of an estimated 11,400 dwelling units. Commitments made under this policy require cash contributions and build-out schedules within five years. Those commitments which are not used are subject to withdrawals by WSSC. These "recaptured" commitments, if any, will be allocated to other developers.

The ISSP adopted October, 1976, allocates an estimated capacity of 6.25 million gallons per day for allocation of flows to all basins in Montgomery County tributary to the Blue Plains Treatment Plant: 67 percent residential, 25 percent commercial and industrial, and 8 percent public facilities. The estimate of 11,400 dwelling units is calculated on the approved applications submitted to the WSSC as of June 28, 1977 (see Table 3.3).

Some developers are building plants to provide sewage treatment capacity for their own development. These developments are Montgomery Village, Rossmoor, and Snowden's Mill. Other developments (an estimated 2,700 units) will be built using septic tanks.

The largest single share of sewer commitments are those which were granted before the start of the sewer moratorium. Unlike the more recent sewer allocation techniques, holders of these commitments were not required to deposit any significant amount of money, nor were they subject to recapture provisions. The absence of these requirements, which tends to prevent excessive stockpiling from occurring, leaves open the precise timing of when this development will occur. For purposes of this study, holders of these commitments are still defined as being within the scope of the pipeline, although it is recognized that their inclusion adds an element of unreality, or inflation, to the totals, when compared to the probability of them all actually being built within the assumed time frames.

Table 3.1 summarizes our current estimates of the number of dwelling units that are now in the development pipeline.

THE USE OF DEVELOPMENT PIPELINE DATA

Relationship to Forecasting

Projects which have sewer commitments are at most one step away from starting construction. These landholders have gone through the time and expense of both subdivision and sewer approval. They have made an investment which states the amount and location of dwelling units they believe can be absorbed by the market. Their conception of the future housing market is backed by their investment. When sewer commitments are arrayed by planning area and major drainage basin, it becomes the best short-range indicator of where and when developers wish to build.

TABLE 3.1

PIPELINE TREATMENT CAPACITY FOR DWELLING UNITS BY FORECAST AREA AND PLANNING AREA

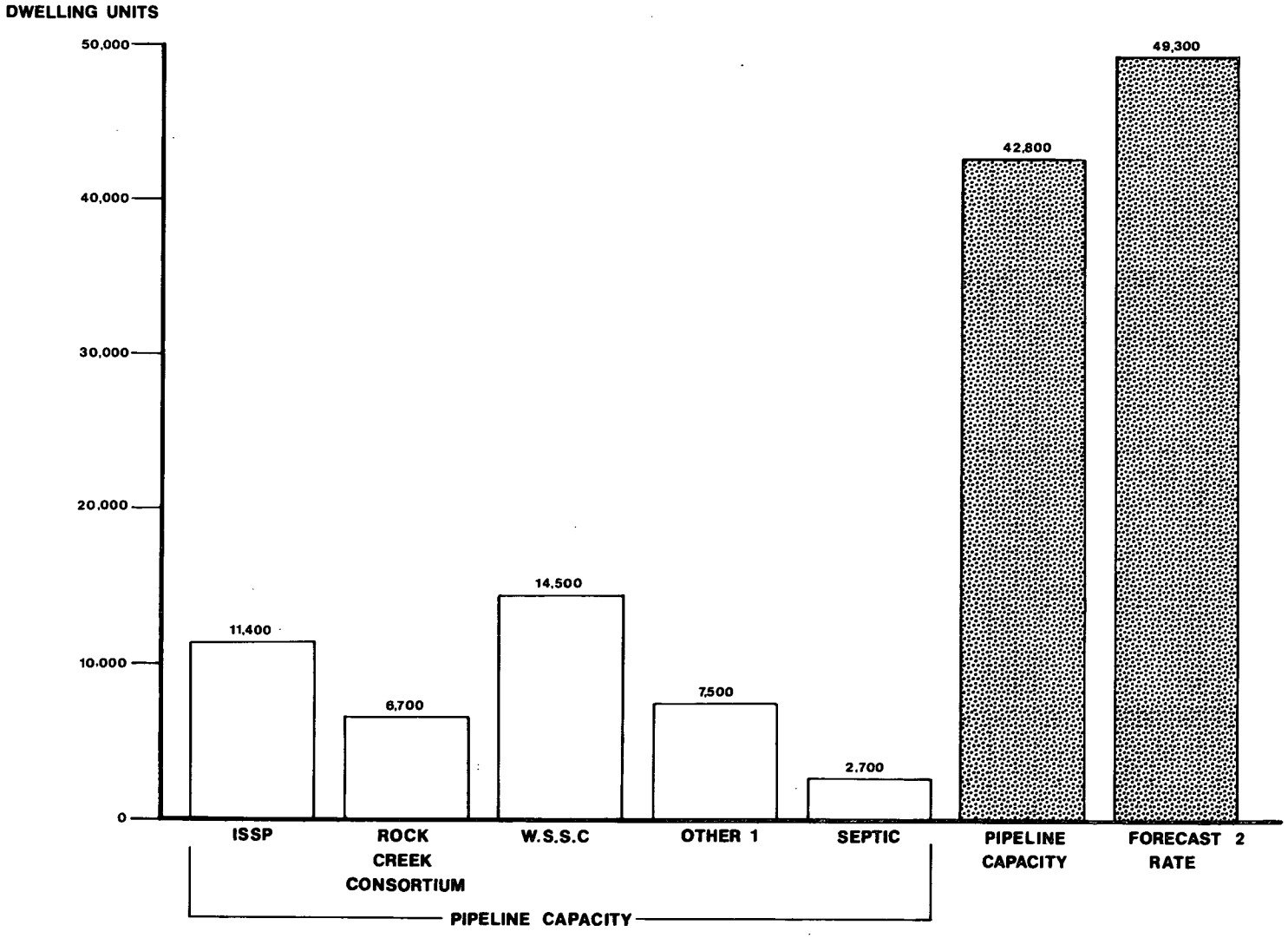
Forecast and Planning Area	ISSP	Rock Creek Consortium	WSSC	Other[1]	Totals[2]
Urban Ring	2,106	3,619	3,188	5,700	14,613
PA 26 Rockville	--	--	--	3,400	3,400
27 Aspen Hill	1,224	487	1,206	2,300	5,217
30 N. Bethesda	37	1,332	1,006	--	2,375
31 Wheaton	227	610	32	--	869
32 Kemp Mill	4	--	6	--	10
35 Bethesda	523	1,064	924	--	2,511
36 Silver Spring	34	126	7	--	167
37 Takoma Park	57	--	7	--	64
I-270 Corridor	4,379	642	7,826	1,375	14,222
13 Clarksburg	--	--	0	75	75
19 Germantown	1,911	--	4,418	--	6,329
20&21 Gaithersburg	2,468	642	3,408	1,300	7,818
Colesville	1,415	--	1,550	560	3,525
28 Cloverly	83	--	73	40	196 ←
33 White Oak	485	--	681	--	1,166
34 Fairland	847	--	796	520	2,163
Potomac	1,197	1,015	1,285	405	3,902
24 Darnestown	10	219	79	115	423
25 Travilah	161	49	118	290	618
29 Potomac	1,026	747	1,088	--	2,861
Olney	97	1,408	80	655	2,240
22 Rock Creek	26	--	15	475	516
23 Olney	71	1,408	65	180	1,724
Damascus			612	1,235	1,847
10 Bennett			--	290	290
11 Damascus			612	70	682
14 Goshen			--	575	575
15 Patuxent			--	300	300
Poolesville				260	260
12 Dickerson				70	70
16 Martinsburg				50	50
17 Poolesville				60	60
18 Lower Seneca				80	80
Subtotal	9,194	6,684	14,541	10,190	40,609
Unvarified Locations	2,208				2,208
TOTAL PIPELINE CAPACITY	11,402	6,684	14,541	10,190	42,817

[1] This category includes estimates for Montgomery Village, Rossmoor, Snowden's Mill, the City of Rockville and septic development.

[2] Note: Some double counting may exist in between major categories.

SOURCE: Montgomery County Planning Board, Planning Information File, July, 1977.

Comparison Of Pipeline Treatment Capacities For Dwelling Units With Forecast Completion Rate Of Units 1977–1986



1 This Category Includes Estimates for Montgomery Village, Rossmoor, Snowden's Mill and the City of Rockville.

SOURCE: Montgomery County Planning Board, Planning Information File.

2 Intermediate Rate 1976–1986 Less Growth.

Jan. 1976 – June 1976

FIGURE 3.1

TABLE 3.2

DWELLING UNITS APPROVED UNDER THE
ROCK CREEK CONSORTIUM, BY PLANNING AREA
JULY, 1977

Forecast and Planning Area	Single-Family	Town-houses	Apart-ments	Total	Percent of Total County
Urban Ring	436	565	2,618	3,619	54.1
PA 26 Rockville	0	0	0	0	--
27 Aspen Hill	0	182	305	487	7.3
30 No. Bethesda	108	137	1,087	1,332	19.9
31 Wheaton	50	120	440	610	9.1
32 Kemp Mill	0	0	0	0	--
35 Bethesda	278	0	786	1,064	15.9
36 Silver Spring	0	126	0	126	1.9
37 Takoma Park	0	0	0	0	--
I-270 Corridor	642	0	0	642	9.6
PA 12 Clarksburg	0	0	0	0	--
19 Germantown	0	0	0	0	--
20&21 Gaithersburg	642	0	0	642	9.6
Colesville	0	0	0	0	--
PA 28 Cloverly	0	0	0	0	--
33 White Oak	0	0	0	0	--
34 Fairland	0	0	0	0	--
Potomac	581	434	0	1,015	15.2
PA 24 Darnestown	187	32	0	219	3.3
25 Travilah	49	0	0	49	.7
29 Potomac	345	402	0	747	11.2
Olney	926	482	0	1,408	21.1
PA 22 Rock Creek	0	0	0	0	--
23 Olney	926	482	0	1,408	21.1
Total County	2,585	1,481	2,618	6,684	100.0

SOURCE: Development Review Division (from Consortium developers), Montgomery County Planning Board.

TABLE 3.3

DWELLING UNITS APPROVED UNDER MONTGOMERY COUNTY
INTERIM SEWER SERVICE POLICY, BY PLANNING AREA
JUNE 28, 1977

Forecast and Planning Area	Single-Family & Townhouses	Apart-ments	Total
Urban Ring	832	1,274	2,106
PA 26 Rockville	0	0	0
27 Aspen Hill	362	862	1,224
30 No. Bethesda	37	0	37
31 Wheaton	211	16	227
32 Kemp Mill	4	0	4
35 Bethesda	183	340	523
36 Silver Spring	34	0	34
37 Takoma Park	1	56	57
I-270 Corridor	2,027	2,352	4,379
PA 13 Clarksburg	0	0	0
19 Germantown	221	1,690	1,911
20&21 Gaithersburg	1,501	662	2,468
Colesville	560	855	1,415
PA 28 Cloverly	83	0	83
33 White Oak	135	350	485
34 Fairland	342	505	847
Potomac	567	630	1,197
PA 24 Darnestown	10	0	10
25 Travilah	161	0	161
29 Potomac	396	630	1,026
Olney	97	0	97
PA 22 Rock Creek	26	0	26
23 Olney	71	0	71
Subtotal County	4,083	5,111	9,194

NOTE: 1. Class 3a - individually owned single-family units are undersubscribed - approximately 208 dwelling units. 208

2. Class 3c, Section 8 - G.N.M.A. Project is undersubscribed - approximately 2,000 dwelling units. 2,000

Total County 11,402

TABLE 3.4

DWELLING UNITS APPROVED BY
OUTSTANDING WSSC COMMITMENTS, BY PLANNING AREA
JUNE, 1977

Forecast and Planning Area	Single-Family & Townhouses	Apart-ments	Total	Percent of Total County
Urban Ring	1,456	1,732	3,188	21.9
PA 26 Rockville	0	0	0	--
* 27 Aspen Hill	561	645	1,206	8.3
30 No. Bethesda	519	487	1,006	7.0
31 Wheaton	32	0	32	.2
32 Kemp Mill	6	0	6	--
35 Bethesda	324	600	924	6.4
36 Silver Spring	7	0	7	--
37 Takoma Park	7	0	7	--
I-270 Corridor	4,676	3,350	7,826	53.9
PA 13 Clarksburg	0	0	0	--
19 Germantown	1,264	3,154	4,418	30.5
20&21 Gaithersburg	3,212	196	3,408	23.4
Colesville	126	1,424	1,550	10.7
PA 28 Cloverly	73	0	73	.5
33 White Oak	31	650	681	4.7
34 Fairland	22	774	796	5.5
Potomac	1,645	335	1,285	8.8
24 Darnestown	79	0	79	.5
25 Travilah	118	0	118	.8
29 Potomac	753	335	1,088	7.5
Olney	1,251	0	80	.5
PA 22 Rock Creek	15	0	15	.1
23 Olney	65	0	65	.4
Poolesville	428	184	612	4.2
PA 11 Damascus	428	184	612	4.2
Total County	9,582	7,025	14,541	100.0

*Aspen Hill does not reflect the new .5 mgd treatment facility for Rossmoor Retirement Community.

SOURCE: Washington Suburban Sanitary Commission Flow Prediction Master File.

TABLE 3.5

COMPARISON OF 1976-1986 GROWTH FORECAST WITH DEVELOPMENT ALREADY IN THE PIPELINE

Forecast and Planning Area	'76-'86 Forecast Dwelling Units	Dwelling Unit Completions Jan. '76-April '77	'76-'86 Forecast	Pipeline Totals	Difference Between Sewer Pipeline and the Forecast
Urban Ring	19,130	493	18,637	14,613	+ 4,024
PA 26 Rockville	3,430	122	3,308	3,400	- 92
27 Aspen Hill	3,600	244	3,356	5,217	- 1,861
30 N. Bethesda	3,600	14	3,586	2,375	+ 1,211
31 Wheaton	1,730	4	1,726	869	+ 857
32 Kemp Mill	1,330	10	1,320	10	+ 1,310
35 Bethesda	2,800	98	2,702	2,511	+ 191
36 Silver Spring	2,530	--	2,530	167	+ 2,363
37 Takoma Park	110	1	109	64	+ 45
I-270 Corridor	16,750	1,686	15,064	14,222	+ 842
PA 13 Clarksburg	550	12	538	75	+ 463
19 Germantown	7,750	388	7,362	6,329	+ 1,033
20&21 Gaithersburg	8,450	1,286	7,164	7,818	- 654
Colesville	3,950	72	3,878	3,525	+ 353
PA 28 Cloverly	650	57	593	196	+ 397
33 White Oak	1,600	9	1,591	1,166	+ 425
34 Fairland	1,700	6	1,694	2,163	- 469
Potomac	5,850	450	5,400	3,902	+ 1,498
PA 24 Darnestown	550	61	489	423	+ 66
25 Travilah	1,700	156	1,544	618	+ 926
29 Potomac	3,600	233	3,367	2,861	+ 506
Olney	4,000	95	3,905	2,240	+ 1,665
PA 22 Rock Creek	700	55	645	516	+ 129
23 Olney	3,300	40	3,260	1,724	+ 1,536
Damascus	1,920	288	1,632	1,847	- 195
PA 10 Bennett	320	55	265	290	- 25
11 Damascus	700	66	634	682	- 48
14 Goshen	550	108	442	575	- 133
15 Patuxent	350	39	311	300	+ 11
Poolesville	900	141	759	260	+ 499
PA 12 Dickerson	70	13	57	70	- 13
16 Martinsburg	50	3	47	50	- 3
17 Poolesville	700	119	581	60	+ 521
18 Lower Seneca	80	6	74	80	- 6
Total County	52,500	3,205	49,295	40,609	+ 8,356
Unvarified Locations				2,208	
TOTAL				42,817	

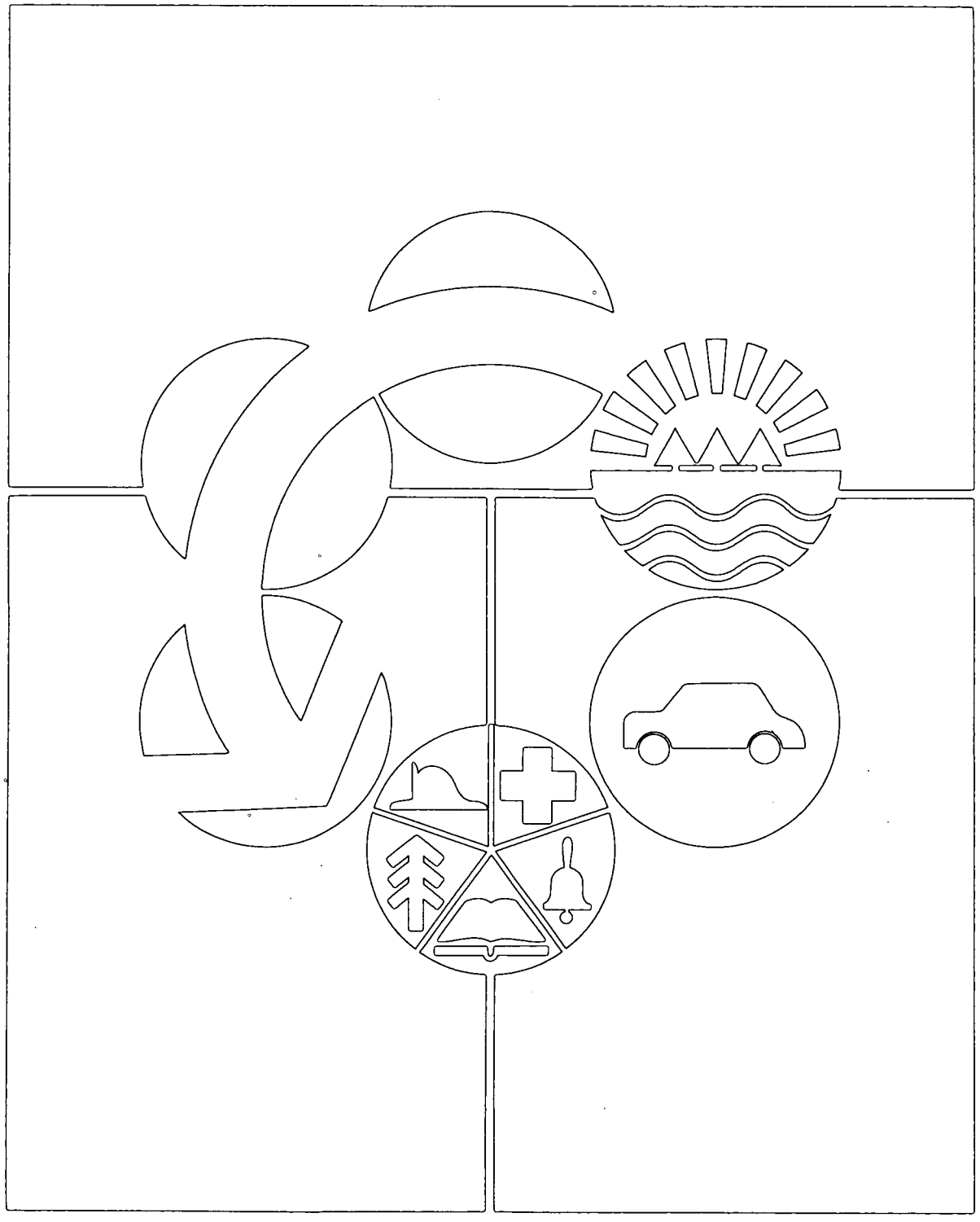
But, whereas the Forecast represents a ten-year view of the future, the pipeline has a somewhat more limited horizon. Both the ISSP and the various consortium plans require developers to proceed within the next five years, although outstanding WSSC commitments do not have any time constraints. The Forecast assumes that more sewer will become available before the end of the ten years. A comparison between the total growth in dwelling units for the next decade, under the Intermediate Forecast, and the total dwelling units in the pipeline, reveals that the pipeline is equal to about 82 percent of the Forecast. Stated another way, if the rate of growth in the Forecast does in fact apply in the future, there is enough capacity in the pipeline to last for about eight years.

There is a slight variation between the pipeline and the Forecast in terms of percentages of growth going to particular areas. The greatest difference occurs in the I-270 Corridor, where the pipeline indicates four percent more of the growth will be located there, as compared to the Forecast. The Forecast anticipates more growth in the down-county areas than is currently in the pipeline, but the majority of this growth is expected after 1981. Within the Urban Ring, the largest number of pipeline commitments are in Rockville and in Aspen Hill on the Rossmoor retirement community (see Table 3.5).

Relationship to Impact Assessment

At the time of the initial compilation of the development pipeline (in the summer of 1977) a single integrated list for all possible sewer service commitments did not exist. One of the major problems has been eliminating double counting, since some developments were shown on more than one of the sewer commitment lists. For example, some participants in the Rock Creek Consortium were also shown on the WSSC list. This double counting resulted in a first-cut estimate of the development pipeline which was ten percent higher than in the Table 3.1. The errors were primarily in the Gaithersburg, Olney, and Potomac areas. The impact assessments were made using the first-cut estimate of the pipeline, due to the time needed to make those assessments within the time frame for publication. As it happens, the magnitude of the double counting is not sufficient to significantly alter the major conclusions of the impact assessments in Chapters IV through VII.

The development pipeline is by no means static. The tables of the pipeline indicate the sewer commitment allocation as of July, 1977. The listing of outstanding commitments changes monthly. As hook-ups into the sewer system are made, the commitments cease to be a future obligation. Commitments in the consortium plants can change hands at any time. ISSP commitments are subject to recapture and redistribution. Any future additional allocation of sewer capacity would likewise change the quantity and geographic distribution of the development pipeline. It is, therefore, necessary to develop an accurate accounting and monitoring system, if planning analyses are to be up to date. Further refinement of such a system is desirable.



Chapter Four

IMPACT of "PIPELINE" on PRESENT ZONING CAPACITY

CHAPTER IV

IMPACT OF "PIPELINE" ON PRESENT ZONING CAPACITY

SUMMARY

This is an assessment of the relationship between the amount of residential growth in the pipeline and the County's unused residential holding capacity under existing zoning. A preliminary inventory of vacant land is portrayed, as well as the definition and methodolgy used to derive that inventory. The inventory lists the dwelling unit holding capacity by major residential land use and sewer service categories.

The present pattern of development and zoning is adhering fairly closely to the General Plan. Under existing zoning there is enough vacant land (defined as land which at present has no improvement, or improvement worth less than the land value, or farm assessment) for an estimated 173,000 dwelling units. Of this total, about 100,000 dwelling units can be accommodated within the current sewer envelope. There is more than twice the land needed for the "pipeline." The ten-year Intermediate Forecast would, however, use most of the available small-lot single-family and garden apartment land outside of the I-270 Corridor and Colesville area. The twenty-year Intermediate Forecast would use up a very large proportion of the present sewer envelope, while the twenty-year Trend Forecast would more than use it all.

BACKGROUND

The Montgomery County Planning Board is studying the current residential zoning pattern of the County. The study is not yet complete, so there may be future numerical adjustments to the tables which follow. However, we believe that the information in its current form is sufficient for general planning analysis. The data is now an important component of our Planning Information File and a necessary part of an integrated growth management accounting system. This study represents the first major attempt to analyze the carrying capacity of residentially zoned land since 1971. The 1971 study was essentially a hand attempt which assigned a large contingent of draftsmen to work with aerial photographs, the Zoning Atlas, and 1,000-scale maps. This data was probably current to early 1970. The information was not subsequently updated because of the system's excessive manpower requirements.

Our present effort is an attempt to build an automated system which can efficiently report data, on a timely semi-annual basis, in both tabular and computer map formats. The development of this automated system has been severely hampered by inaccuracies found in the Parcel File's assignment of zoning codes and errors in the County's Conversion File. This summer our staff began a massive effort to "clean up" this data and transpose it to our Planning Information File. However, it should be noted that we have not yet resolved the problem of how to assure that the Parcel File and the Conversion Files will be updated on a timely basis. County Council support for the timely provision of data by all agencies involved would seem very desirable, if this effort is to be maintained in the future.

In this study, emphasis is placed on estimating dwelling unit holding capacity rather than population holding capacity. Previous studies have attempted to estimate population capacity, but this requires estimates of average household size for some specific date in the future. Such estimates require judgments concerning future birth rates, death rates, and living arrangements. The problem is compounded since the date at which holding capacity will be reached is not known. Thus, population holding capacity numbers are inconclusive and often confusing, since the same dwelling unit total can lead to significantly different population estimates through the use of different average household size assumptions.

The basic inputs to the residential zoning capacity element are the vacant land definition, Assessor's Parcel File, estimated dwelling unit yields per acre for each residential zone, current developer land use plans for planned community zones (TS, PRC, PD), current housing unit inventory, and estimated redevelopment capacity for transit station areas (TSA) and central business district areas (CBD). The inputs are explained below.

Vacant Land Definition: We have defined three major types of vacant land for analysis purposes:

1. Parcels with zero improvement value
2. Parcels with land value exceeding improvement value (particularly vacant)
3. Farm assessed land

In this report the term "vacant" refers to the sum of the above but excluding: public land, all private land having tax exempt status which is used for cultural and recreation purposes, and other private recreational land such as country clubs.

Parcel File - This file contains a record for every parcel in the County. The file is searched to discover records which meet the vacant land definition. The current

zoning and acreage for the vacant land is then summed by geographic areas.

Estimated Dwelling Unit Yields - Staff utilized a sample of past subdivision data to estimate the average expected per-acre housing unit yields for existing specific zoning classifications, and estimates were made for new zones which have not yet accumulated subdivision experience.

Planned Community Zones - For those zones which provide developers with significant flexibility with regard to dwelling densities and housing time, the staff analyzed the land use and site plans which have been submitted to the Montgomery County Planning Board by developers. This approach produces satisfactory dwelling unit estimates; however, capacities by housing structure type are difficult to estimate. For general planning purposes, staff assumed a 50/50 split between small-lot residential and garden apartment units for these zones. Experience shows that only in exceptional cases do developers build large-lot single-family and high-rise units in these zones.

Current Housing Inventory - The total residential holding capacity is determined by adding the capacity of vacant land to the current number of existing housing units.

Redevelopment - We have only estimated redevelopment potential for CBD and TSA areas. Adopted sector plans were used where they exist. For areas which do not yet have adopted sector plans, educated guesses were made based on staff knowledge of the area's present characteristics.

IMPACT ASSESSMENT

Our initial assessment of residential holding capacity has been focused on the following:

- Capacity of the Sewer Service Envelope--areas where sewer service is existing or planned during the next ten years.
- Comparison to forecast levels of construction (rates of residential land absorption).
- Capacity of zoned land by structure type and land use.
- Comparison of total holding capacity with the pipeline volume of development approved for sewer service.
- Future land use pattern.

CAPACITY OF THE SEWER SERVICE ENVELOPE

Of the 173,000 dwelling unit capacity for vacant land, approximately 100,800 or 58 percent is within the ten-year sewer service area. According to Table 4.1, most of this capacity or 88,700 units is currently served by sewers or is programmed to receive service within two years—Categories 1-3. Category 4 (3 to 6 years) has capacity for 3,500 units and Category 5 (7-10 years) has capacity for approximately 8,600 units. From a relative standpoint, there is very little actual staging of capacity within the ten-year plan. This is apparent from the computer map (Figure 4.1) which shows the pattern of vacant residential land by sewer service category. Clearly, the important distinction is between capacity within the sewer service envelope (100,800 units) and the zoning capacity of land which is not programmed for sewer service (72,500 units).

TABLE 4.1

DWELLING UNIT POTENTIAL ON VACANT LAND
BY SEWER SERVICE CATEGORY (EXISTING ZONING)

Forecast Area and Planning Area	1-3	4	5	6	Total	M-NCPPC Forecast 1976-1986
Urban Ring	24,764	0	1,052	0	25,816	19,130
PA 26 Rockville	3,358				3,358	3,340
27 Aspen Hill	6,166		1,052		7,218	3,600
30 N. Bethesda	6,022				6,022	3,600
31 Wheaton	1,989				1,989	1,730
32 Kemp Mill	1,929				1,929	1,330
25 Bethesda	4,128				4,128	2,800
36 Silver Spring	539				539	2,530
37 Takoma Park	633				633	110
I-270 Corridor	42,545	1,546	5,568	13,135	62,794	16,750
PA 13 Clarksburg			4,549	6,948	11,497	550
19 Germantown	21,429		1,019	5,186	27,634	7,750
20&21 Gaithersburg	21,116	1,546		1,001	23,663	8,450
Colesville	10,533	1,404	1,995	2,395	16,327	3,950
PA 28 Cloverly	2,032	683	1,280	2,218	6,213	650
33 White Oak	3,795				3,795	1,600
34 Fairland	4,706	721	715	177	6,319	1,700
Potomac	5,379	543	0	11,404	17,326	5,850
PA 24 Darnestown	222			3,926	4,148	550
25 Travilah	111			6,234	6,345	1,700
29 Potomac	5,046	543		1,244	6,833	3,600
Olney	3,112	0	212	13,900	17,224	4,000
PA 22 Rock Creek	314			5,956	6,270	700
23 Olney	2,798		212	7,944	10,954	3,300
Damascus	1,186	0	261	16,904	18,351	1,920
PA 10 Bennett				4,208	4,208	320
11 Damascus	1,186		261	4,190	5,637	700
14 Goshen				5,782	5,782	550
15 Patuxent				2,724	2,724	350
Poolesville	700	0		14,707	15,407	900
PA 12 Dickerson				3,008	3,008	70
16 Martinsburg				1,837	1,837	50
17 Poolesville	700			5,692	6,392	700
18 Lower Seneca				4,170	4,170	80
Total County	88,219	3,493	9,088	72,445	173,245	52,500

SOURCE: Montgomery County Planning Board, Planning Information File, September, 1977.

While the amount of land within, and the amount of land outside, the sewer envelope are not greatly different strictly in terms of the dwelling unit capacity numbers, they do differ significantly in land area, and in relative utility to the development industry (see Figure 4.1). While the land outside the sewer envelope accounts for only 42 percent of the dwelling unit capacity, it comprises 75 percent of the vacant land area. From a marketing standpoint, land within the sewer envelope is of much greater value to the housing industry. Essentially, this is because in the area outside of the sewer envelope, a combination of low-density zoning and septic system requirements necessitate large single-family lots, which typically mean expensive homes aimed at the higher income brackets. The more popular small-lot and apartment zoning is reserved for areas which are planned to be served by public sewer service.

COMPARISON OF PLANNED RESIDENTIAL HOLDING CAPACITY TO FORECAST LEVELS OF CONSTRUCTION

Table 4.2 shows that the planned capacity is more than twice the amount required for currently anticipated growth through 1986 (see 1976 Forecast: People, Jobs and Housing). As we explain in the section of this report on pipeline capacity, most of the units which are expected to be built by 1986 are already assigned sewer capacity. Therefore, close to one-half of the available capacity in the sewer envelope is already committed. If we were to assume that the sewer service envelope would remain unchanged after 1986, then a very high proportion of the sewered area would be used up by 1995, assuming the growth of our Intermediate Forecast. By comparison, the higher rate of growth, the trend rate, would consume virtually all of the development capacity of the sewer envelope.

However, assumption of a constant sewer envelope is a condition which would tend to make the higher forecast unlikely, because, as the sewer envelope becomes filled up, competition for land will increase, land prices will rise and speculative conditions will tend to keep many parcels from actual development. In addition, for one purpose or another some parcels in a large urban area can be expected never to develop. Some parcels will be bought for public purposes and some will be used for non-residential purposes. Also, to be remembered is that there still remains some leeway to expand the sewer envelope within the holding capacity of such present master plans, as Germantown. Further analysis of these relationships will be pursued in 1978.

CAPACITY OF ZONED LAND BY STRUCTURE TYPE AND LAND USE (See Table 4.3)

Approximately 90 percent of the vacant residential land within the sewer envelope is currently zoned for single-family use. This amounts to approximately 30,000 acres. The majority of this land, or 20,000 acres, is zoned for large-lot single-family uses (Figure 4.3). The remaining small-lot zoning accounts for approximately half as much land but an equal number of dwelling units as the large-lot zoning (Figures 4.4 and 4.5). More than 50 percent of the small-lot zoning capacity is located within the planned development zones and is concentrated in the I-270 Corridor. The only other major concentration is found in the Colesville-White Oak forecast area. The Urban Ring area accounts for 43 percent of the remaining small-lot land which is not in the planned community zones; however, most of this zoning is spread out among many small parcels which tends to slow the pace of its development, since each lot must be developed piecemeal.

Similar to the situation with small lot zoning, most garden apartment capacity is within the planned community zones and concentrated in the I-270 Corridor. Outside of the corridor the only major concentration of vacant garden apartment land is in the Fairland planning area (Figure 4.6).

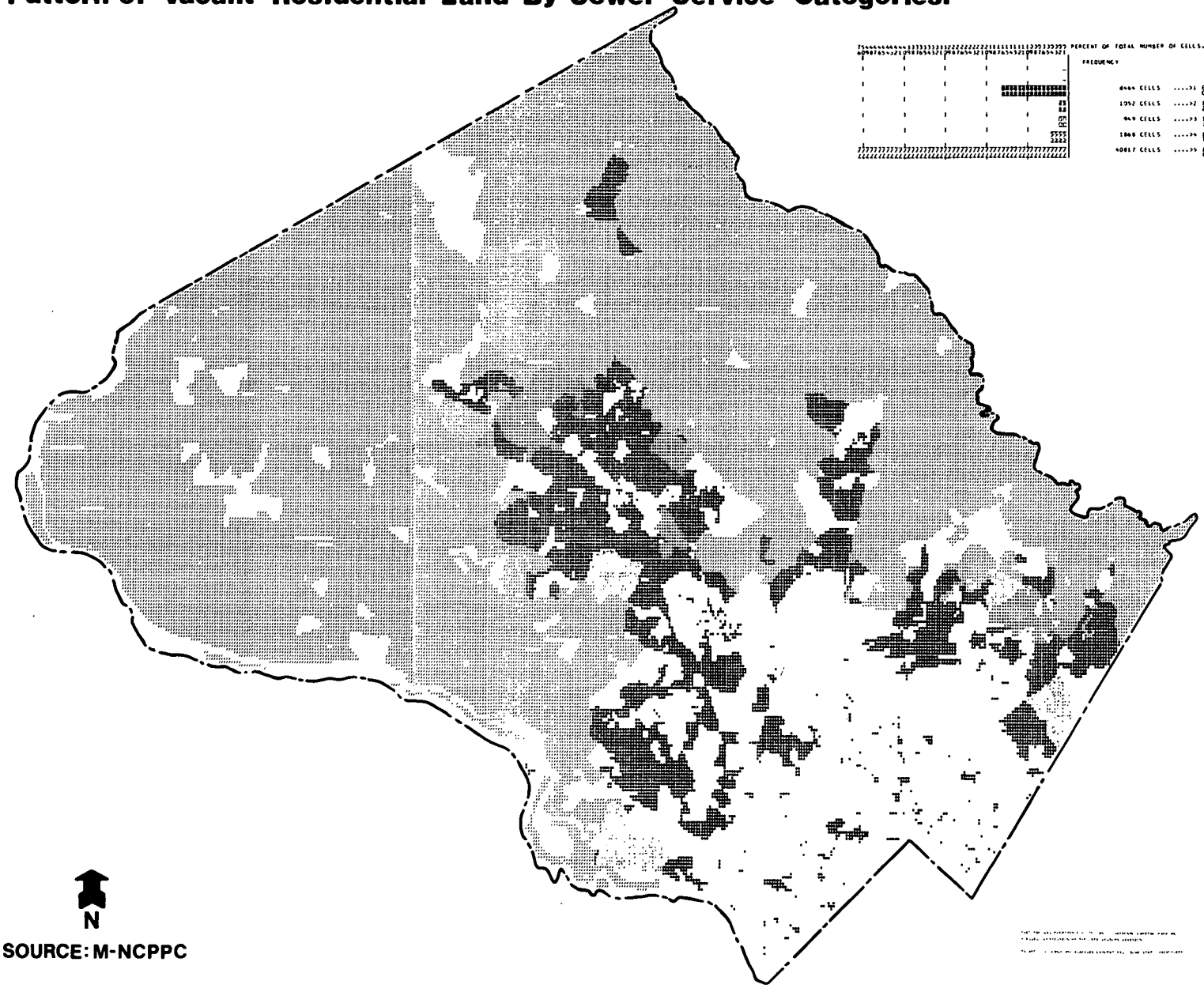
Most high-density capacity is within the central business districts and transit station areas on land which will require redevelopment. Vacant land, as contrasted with redevelopable land, accounts for 40 percent of the high-rise potential and is concentrated in the Urban Ring and I-270 Corridor (See Figure 4.7). The market for high-density residential development has been weak in recent years. A combination of high-interest land costs and construction costs currently limit the potential development of this zoning to prestige locations within the County, where high rental and sales prices can be realized. This is because market conditions favor the development of luxury condominiums over rental projects. One exception would be the development of subsidized elderly housing.

COMPARISON OF TOTAL HOLDING CAPACITY TO THE "PIPELINE" VOLUME OF DEVELOPMENT

The amount of development which is now in the pipeline is concentrated in the I-270 Corridor and the Urban Ring which are the forecast areas having the largest shares of zoning capacity within the sewer envelope. After subtracting the pipeline commitments from the zoned capacity, these areas continue to be locations of major development potential, as shown in Figure 4.8. Pipeline commitments absorb all but 1,000 units of the capacity planned to be sewered in the Olney area and one-half of the capacity of the Potomac area. Significant capacity will remain in the Colesville area which has been subject to the Anacostia treatment moratoria and probably has been shielded thereby from developers applying for preliminary plans and sewer authorizations.

Pipeline commitments account for approximately 42 percent of the the total vacant land capacity within the

Pattern of Vacant Residential Land By Sewer Service Categories.



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SOURCE: M-NCPPC

FIGURE 4.1

TABLE 4.2

COMPARISON OF PROJECTED DEMAND FOR SEWERED RESIDENTIAL LAND
TO AVAILABLE CAPACITY IN SEWER PLAN CATEGORIES 1-5
(EXISTING ZONING)

Land Use	1976 Capacity[6]	1986 Demand[7]	1986 % Capacity[8]	1995 (Intermediate) Demand[9]	1995 (Intermediate) % Capacity	1995 (Trend) Demand[10]	1995 (Trend) % Capacity
Vacant Land							
Single-family	54,300	27,400	50	42,900	79	53,900	99
Large Lot[1]	28,800	15,200	53	23,900	83	28,800	100
Small Lot[2]	25,500	12,200	48	19,000	75	25,100	98
Apartment	46,500	17,200	37	29,700	64	46,200	99
Garden[3]	28,200	13,800	49	21,300	76	28,200	100
High-rise[4]	18,300	3,400	19	8,400	46	18,000	98
Subtotal Vacant Land	100,800	44,600	44	72,600	72	100,100	99
Redevelopment							
High Density[5]	27,000	2,000	7	5,000	19	9,000	33
TOTAL	127,800	46,600	36	77,600	61	109,100	85

SOURCE: Montgomery County Planning Board, September 16, 1977.

1 All residential zones requiring ½ acre or more per dwelling unit.

2 All residential zones requiring less than ½ acre per dwelling unit. Townhouses are not separated because they can be clustered in several zones in addition to the R-T Zone. We have included ½ of the capacity of planned community zones in this category (TS, PRC, PD-9). The number was calculated based upon the percentage of small lot single-family zones upon which building permits were issued as compared to the total number of single-family building permits during 1967 through 1972.

3 Garden apartments include R-30 through R-18 zoning categories. The number of garden apartments are determined by the residual of all multi-family units minus the estimated number of high-rise units. One half of the planned community potential was assumed to be garden apartments.

4 High-rise includes R-H and R-10 Zoning. The 1986 figure was calculated from the high-rise headship rates in 1974 applied to the 1986 age distribution of the County minus the high-rise households in 1976. The 1995 intermediate figure assumes the same proportion of multi-family unit development will be high-rise as is expected to be the case in 1986. The 1995 trend high-rise number assumes that the mix of development will be the same as historic proportion of building permit applications before the effects of the sewer moratorium were felt. This number was then raised to the point where the number of forecasted garden apartments (the residual of total multi-family units minus high-rise units) did not exceed the total capacity for garden apartments.

5 This includes the redevelopment potential in all central business districts and transit station areas.

6 This is the "effective" zoning capacity on private vacant or partially vacant land and estimated redevelopment holding capacity in the central business districts and transit station areas of dwelling units.

7 This is the 1976-1986 forecast minus dwelling unit completion from January, 1976, through June, 1977. Note that the total does not include those dwellings expected to be built on septic systems.

8 Demand divided by capacity.

9 This is the 1975-1995 intermediate forecast minus dwelling unit completions from January, 1975, to June, 1977.

10 This is the 1975-1995 trend forecast minus dwelling unit completions from January, 1975, to June, 1977.

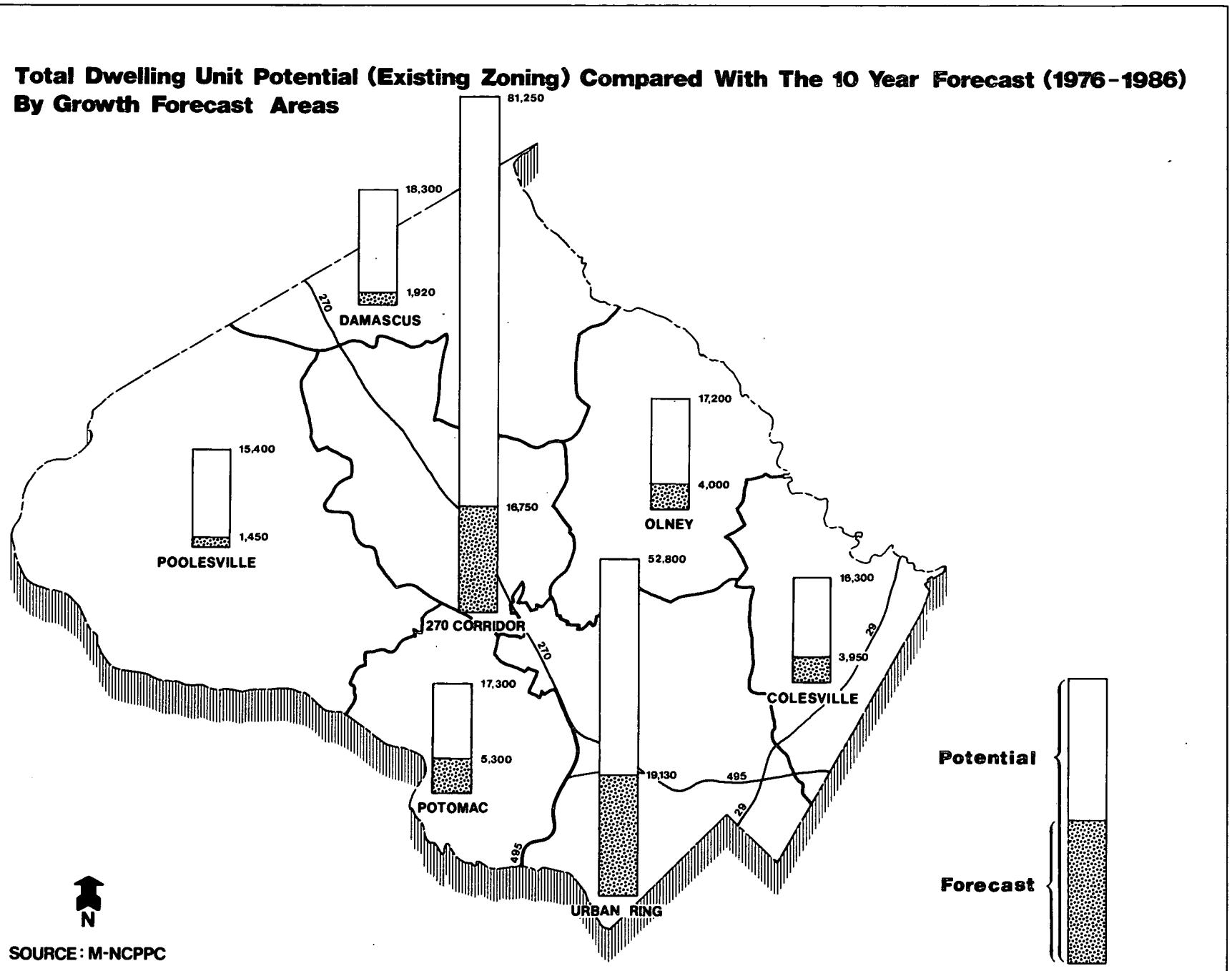

Total Dwelling Unit Potential (Existing Zoning) Compared With The 10 Year Forecast (1976-1986)
By Growth Forecast Areas
81,250
18,300
1,920
DAMASCUS
270
17,200
4,000
OLNEY
15,400
1,450
POOLESVILLE
16,750
52,800
270 CORRIDOR
270
16,300
3,950
COLESVILLE
29
17,300
5,300
POTOMAC
19,130
495
URBAN RING
495
29
Potential
Forecast
N
SOURCE: M-NCPPC

FIGURE 4.2

TABLE 4.3

EXISTING DWELLING UNIT ZONING CAPACITY ON VACANT LAND
FOR MAJOR RESIDENTIAL CATEGORIES BY PLANNING AREA
(SEWER CATEGORIES 1-5 ONLY)

Forecast Area an Planning Area	High Rise[1]	Garden[2]	R-T[3] Zone	Small Lot[4]	Large Lot[5]	Planned Comm.[6]	Total
Urban Ring	8,156	1,995	579	5,602	4,619	4,865	25,816
PA 26 Rockville		51	59	846	2,402		3,358
27 Aspen Hill		1,118	85	423	1,411	4,181	7,218
30 N. Bethesda	4,550	33	16	496	243	684	6,022
31 Wheaton	30	111	220	1,604	24		1,989
32 Kemp Mil	1,451	9	165	190	114		1,929
35 Bethesda	1,442	580	8	1,687	411		4,128
36 Silver Spring	253	22	26	233	5		539
37 Takoma Park	430	71		123	9		633
I-270 Corridor	6,005	12,716	881	3,285	11,619	15,153	49,659
PA 13 Clarksburg		18			4,531		4,549
19 Germantown	2,300	5,451	245	904	3,533	10,015	22,448
20&21 Gaithersburg	3,705	7,247	636	2,381	3,555	5,138	22,662
Colesville	2,393	3,513	208	1,677	6,141		13,932
PA 28 Cloverly		0		19	3,976		3,995
33 White Oak	955	966		1,096	778		3,795
34 Fairland	1,438	2,547	208	562	1,387		6,142
Potomac	1,710	55	233	1,450	2,474		5,922
PA 24 Darnestown					222		222
25 Travilah					111		111
29 Potomac	1,710	55	233	1,450	2,141		5,589
Olney		16	2	321	2,985		3,324
PA 22 Rock Creek				86	228		314
23 Olney		16	2	235	2,757		3,010
Damascus			511	114	822		1,447
PA 10 Bennett							
11 Damascus			511	114	822		1,447
14 Goshen							
15 Patuxent							
Poolesville				700			700
PA 12 Dickerson							
16 Martinsburg							
17 Poolesville				700			700
18 Lower Seneca							
Total County	18,264	18,295	2,414	13,169	28,660	20,018	100,800

1 R-H and R-10 zones and existing CBD zoning on vacant land.

2 Vacant R-18, R-26 and R-30 land exceeding capacity in planned community zones.

3 This is the R-T zoning category. Townhouses are also permitted in a number of other residential zones and the planned community zones.

4 This includes land in the R-90, R-60, R-150 zones.

5 All residential zones requiring ½ acre or more per dwelling unit.

6 This includes the Town Sector PD, PRC and PN zones. This land is most likely to develop as small lot and garden apartment densities.

SOURCE: MCPB, Planning Information File.

sewer envelope. Although the statistics are not currently available, it appears likely that the pipeline includes most of the small-lot and garden apartment land outside of the I-270 Corridor and the Colesville area, since the development of this land is currently more feasible than large-lot and high-density land.

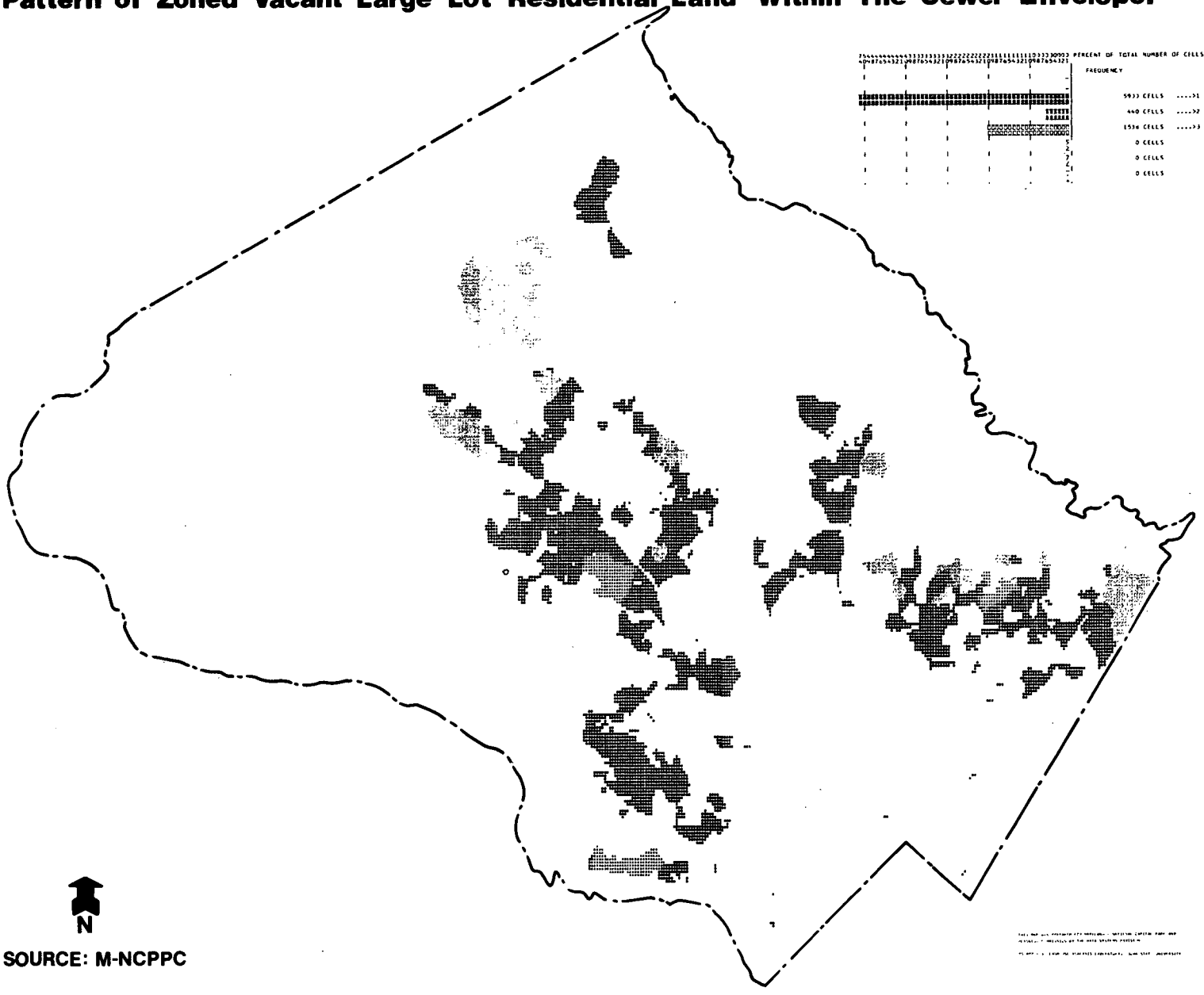
These statistics on the holding capacity and pipeline suggest that within the coming year there could be added market pressure to increase the size of the sewer envelope, and the amount of small-lot and garden apartment zoning. These pressures will be greatest in the vicinity of the eastern and western wedge areas where the pipeline has absorbed the greatest percentages of the already zoned holding capacity. Pressures against the northern wedge should be less, since the I-270 Corridor has both the greatest share of pipeline commitments and vacant land holding capacity.

FUTURE LAND USE PATTERN

If present zoning and sewer policies remain constant, then it becomes a relatively easy matter to envision the long-term development pattern of the County. The density pattern will pretty much follow the design of the General Plan. Higher densities will be confined to central business districts and selected transit station areas, in both the I-270 Corridor cities and the down-County area. Moderate densities will be located in the I-270 Corridor and the remaining zoned areas of the Urban Ring. Densities will decline from the center to the outer edges of the sewer envelope where large-lot zoning currently exists. Still lower densities and large residential lots will cluster along the outside edges of the sewer envelope.

If the present zoning pattern persists in the future, then, beyond 1995, development will likely decline to a rate of from 1,000 to 2,000 units a year as the number of large development parcels become few and

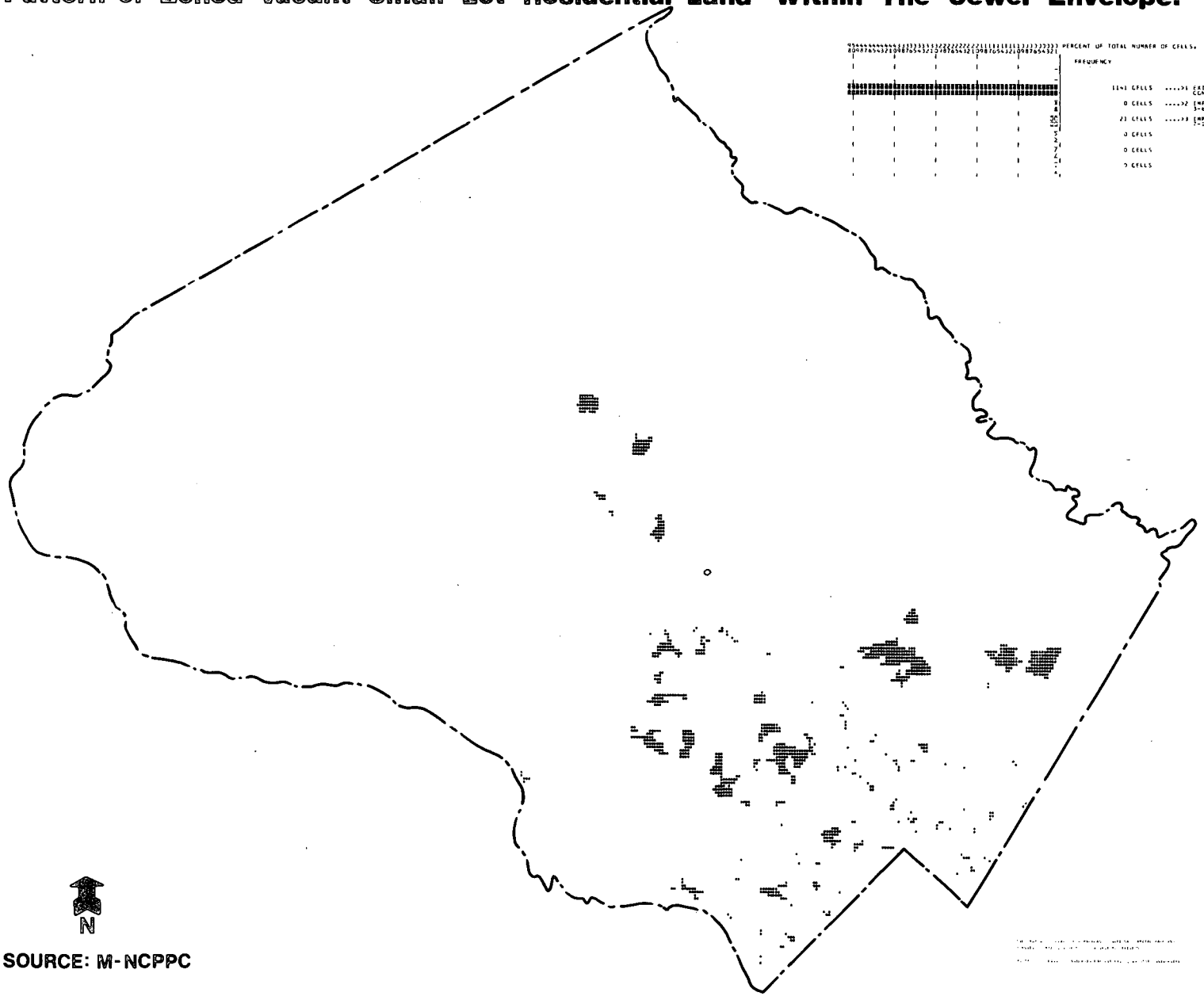
Pattern of Zoned Vacant Large Lot Residential Land Within The Sewer Envelope.



SOURCE: M-NCPPC

FIGURE 4.3

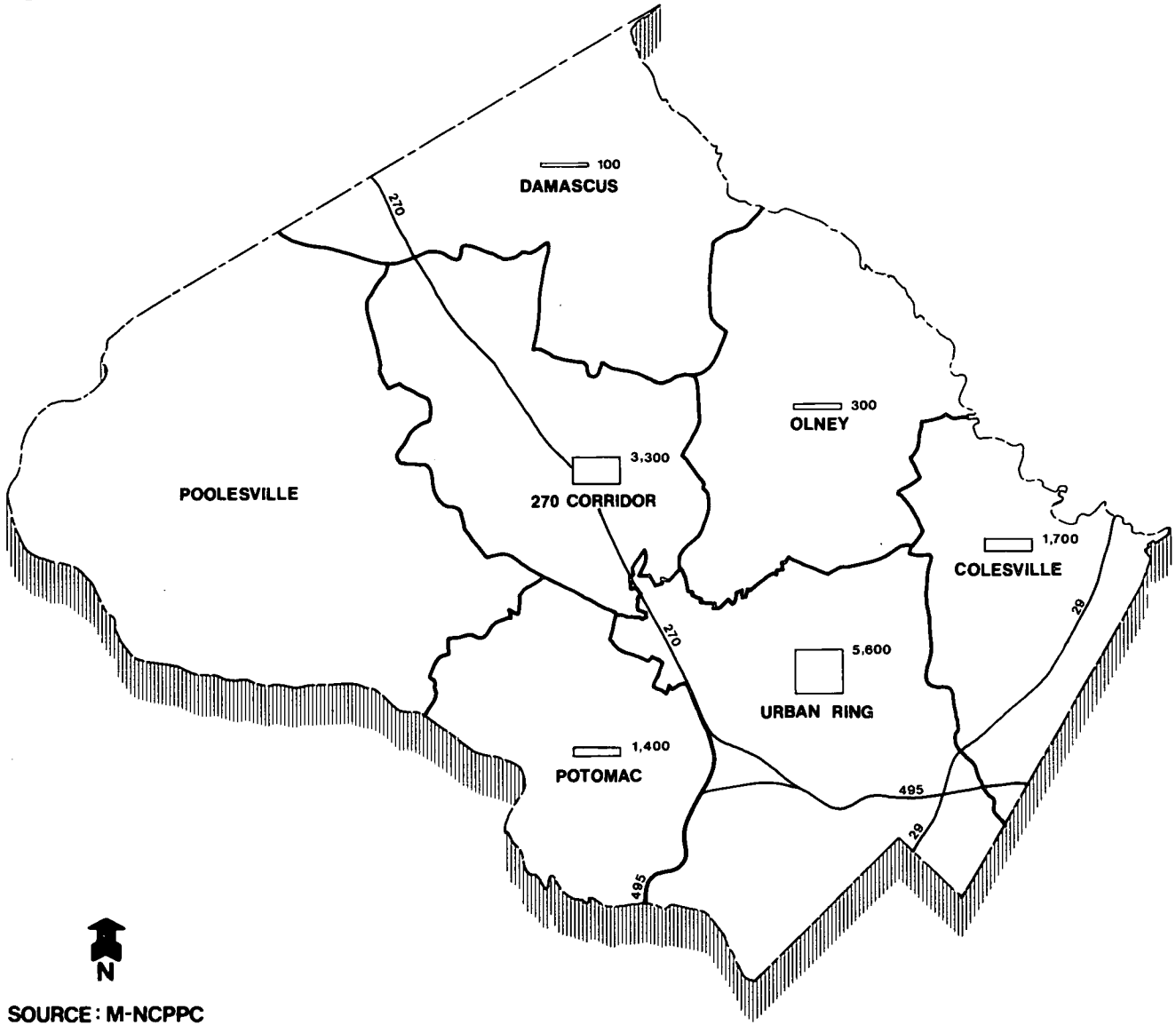
Pattern of Zoned Vacant Small Lot Residential Land Within The Sewer Envelope.



SOURCE: M-NCPPC

FIGURE 4.4

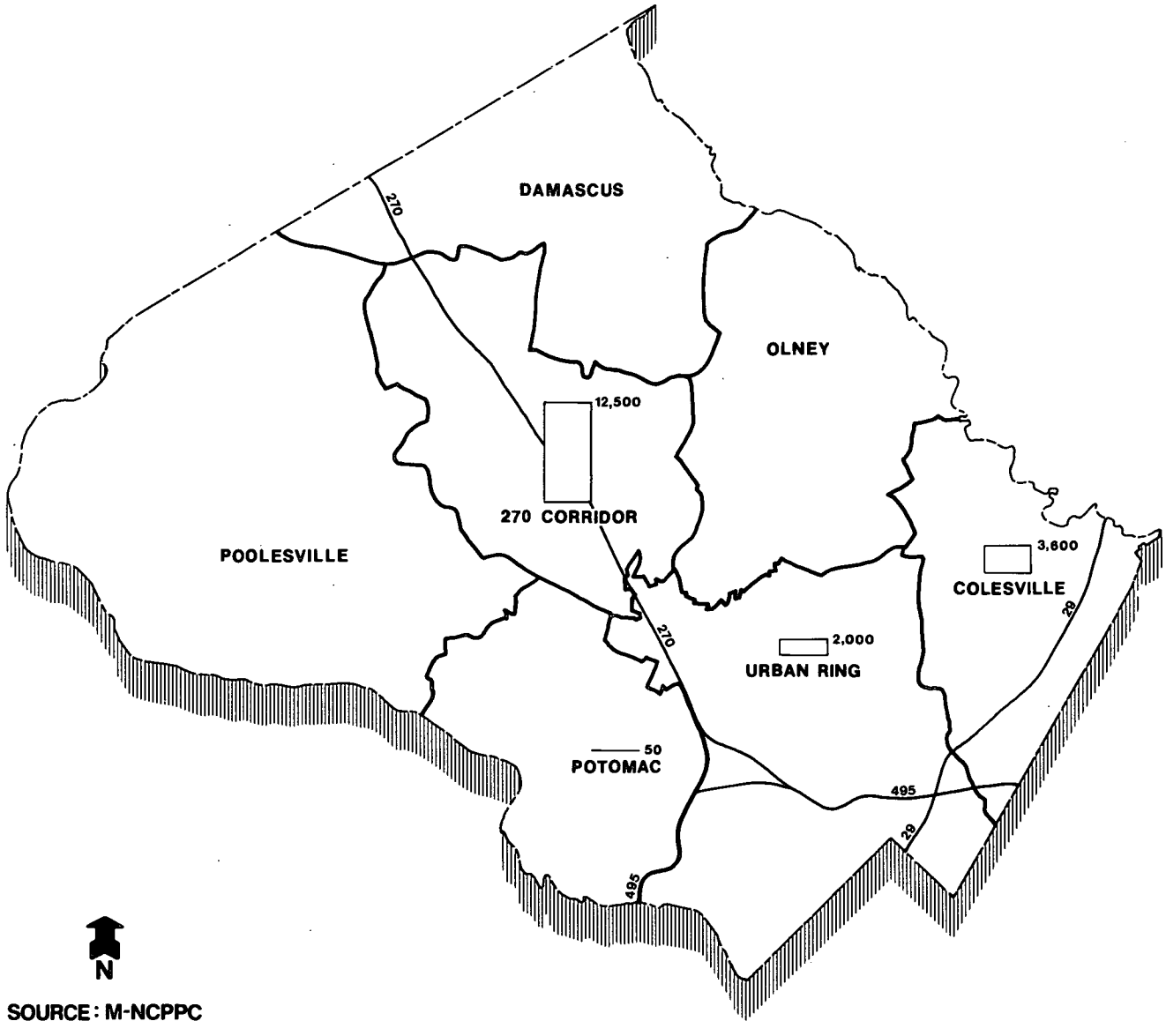
Potential (Existing Zoning) Small Lot Dwelling Units On Vacant R-60, R-90 And R-150 Zoned Land Excluding Planned Community Zones By Growth Forecast Areas



SOURCE: M-NCPPC

FIGURE 4.5

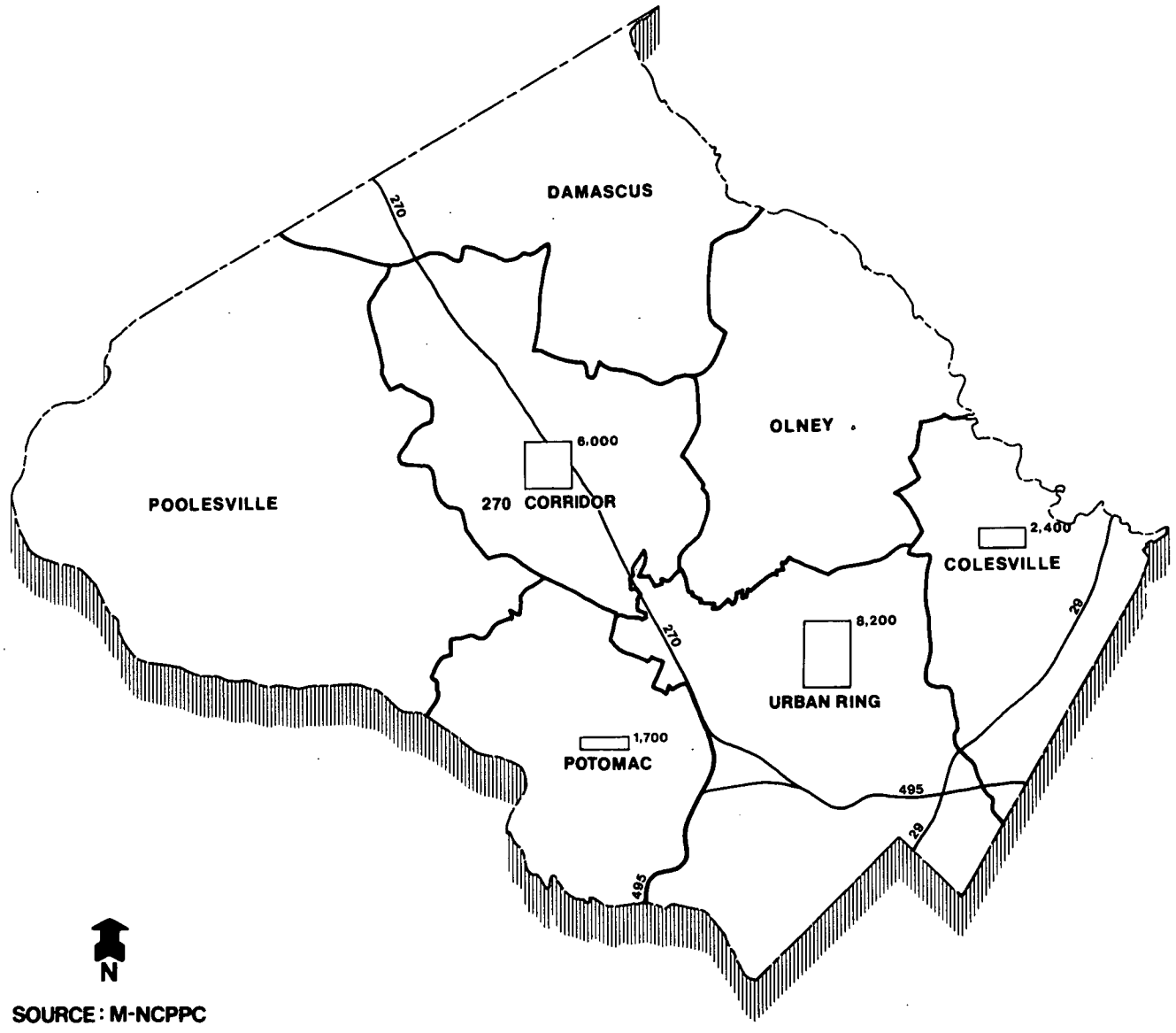
Potential (Existing Zoning) Garden Apartment Dwelling Units on Vacant R-18, R-20, R-30 Land Excluding Planned Community Zones By Growth Forecast Areas



SOURCE: M-NCPPC

FIGURE 4.6

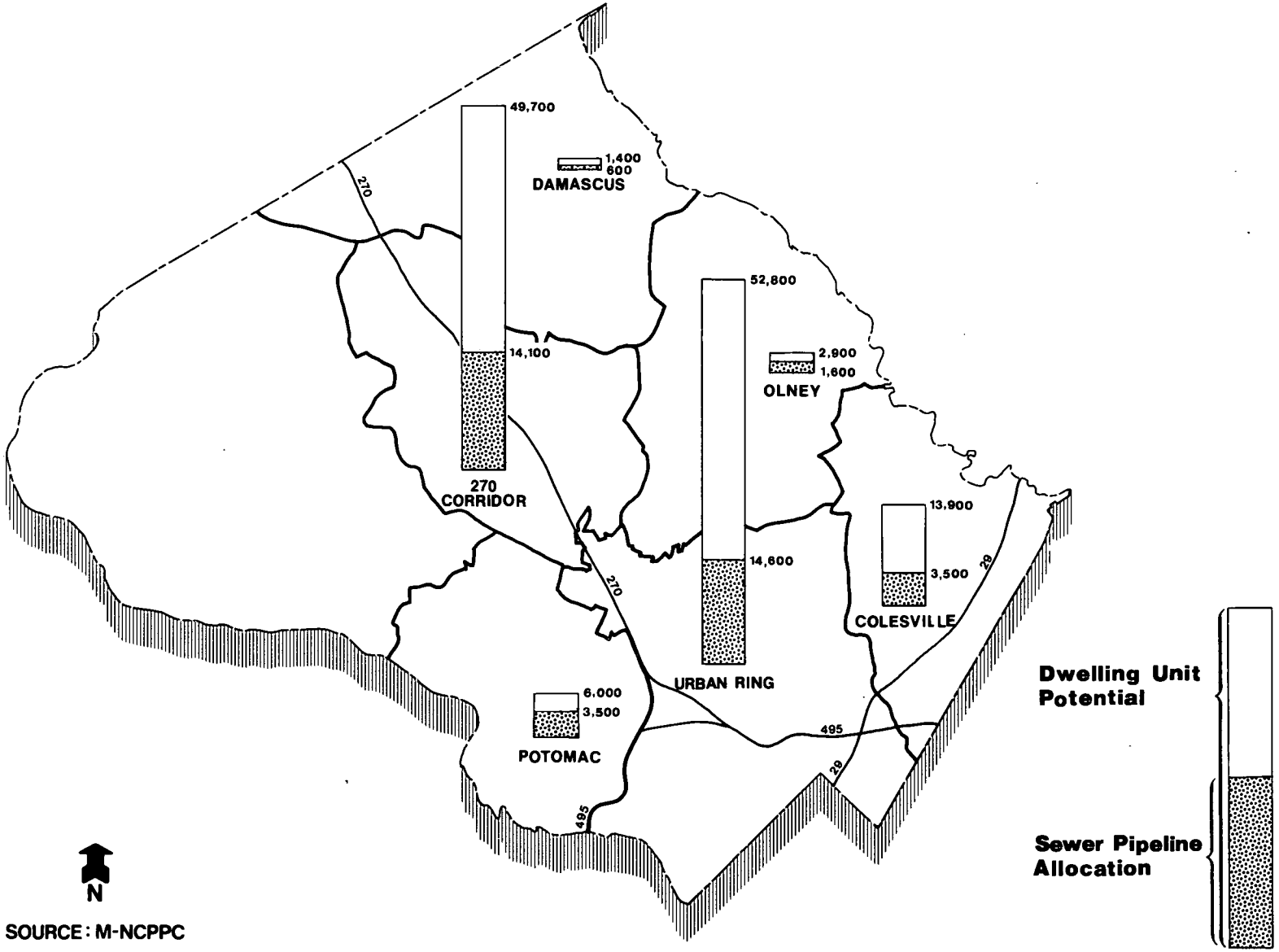
Potential (Existing Zoning) Highrise Dwelling Units On Vacant Land By Growth Forecast Area



SOURCE: M-NCPPC

FIGURE 4.7

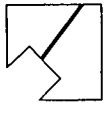
Dwelling Unit Potential (Existing Zoning) In The Sewer Envelope Compared With Sewer Pipeline Allocations By Growth Forecast Areas

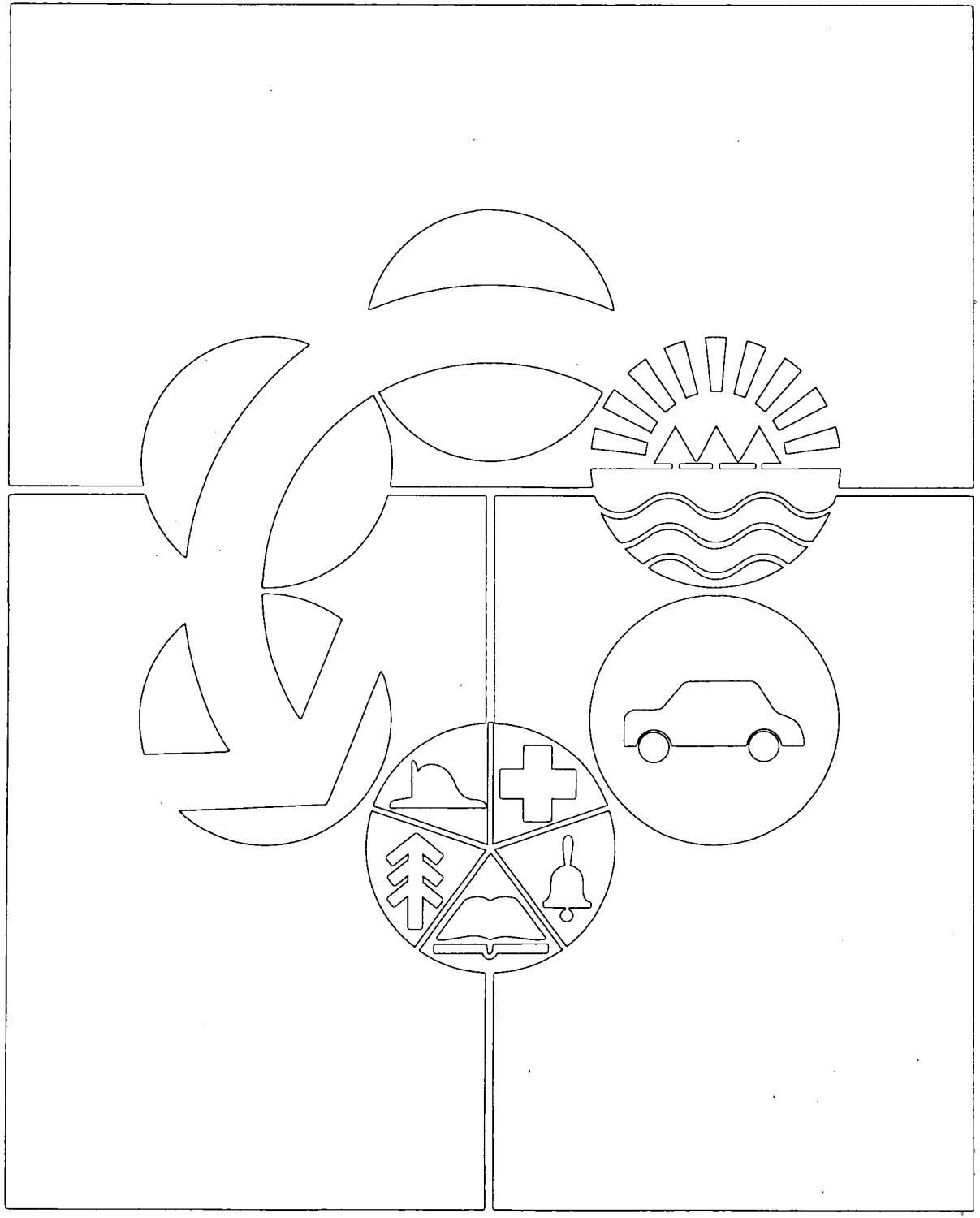


SOURCE: M-NCPPC

FIGURE 4.8

developers concentrate on infilling and redevelopment. A possible problem at that time could be that further expansion of the sewer envelope. Would be impeded by a low-density ring of large-lot subdivision on septic tanks surrounding the sewer envelope. This longer range perspective of growth conditions beyond 1995 should be studied further in future planning programs.





Chapter Five

IMPACT of "PIPELINE" on WATER & SEWER

CHAPTER V

IMPACT OF "PIPELINE" ON WATER AND SEWER

SUMMARY

This chapter assesses the impact of the amount of new growth in the "pipeline" and on the capacity of currently programmed water and sewerage system transmission lines and treatment plants. The discussion is divided into three functional categories--sewerage, water supply, and stormwater.

Sewerage - A computerized model of the capacities of the transmission network would be extremely valuable. With some modification, Washington Suburban Sanitary Commission's SSCAN computer program could be used to simulate average and peak flows based upon existing and future pipeline development. This program could help decision makers determine the adequacy of public facilities and the staging of growth A demonstration analysis of the sewer system network, which considers only the hydraulic capacity of the existing sewer, concludes that some County capital projects possibly could be postponed.

Existing treatment capacity is sufficient for both the "pipeline" and the growth anticipated by the intermediate forecast through the early 1980's. Additional treatment capacity will be required before 1985.

Water Supply - Water supply will be adequate for pipeline development with the implementation of drought management techniques. Lake Site #3 can provide an efficient storage capacity for emergency water supply.

Stormwater - Stormwater runoff associated with the increment of pipeline development can be handled by existing stormwater management policies, including sedimentation and erosion controls.

SEWERAGE

Montgomery County has faced an acute sewer crisis since the early 1970's. Some of the events which have served as a prime catalyst in this regard are:

- Decision of the Potomac River Enforcement Conference to restrict the capacity of the Blue Plains treatment plant to 309 mgd.
- Inability of the Washington Metropolitan Region to develop adequate alternatives to supplement Blue Plains.
- Rejection of the proposed Advanced Waste Treatment Plant (AWT) at Dickerson, Montgomery County by the Environmental Protection Agency.
- Raw sewage overflows in the Anacostia and Cabin John basins, Montgomery County.
- Excessive amounts of infiltration and inflow within certain basins in Montgomery County.
- Unexpected delays in the construction of relief measures.

As a result of the lack of treatment and transmission capacity which resulted in sewage overflows, many basins within the County, were put under State, County, and Washington Suburban Sanitary Commission (WSSC) moratoria orders. These moratoria orders have subsequently governed sewer extensions, connections, and allocations.

Since the original issuance of the moratorium in 1970, the County has come a long way in alleviating the sewerage situation. This was possible due to the recent expansion of the Blue Plains treatment plant, construction of the Seneca Interim and Rock Creek Consortia plants, and measures taken by WSSC to relieve transmission constraints.

The recently adopted Interim Sewer Service Policy provided an improved mechanism for the administrative control of distribution, and recapture of, available capacity by type of dwelling units.

Methodology

In order to evaluate the impact of pipeline growth on sewerage, analysis was made of the following:

- Inventory of Existing Data
- Analysis of Transmission System
- Analysis of Treatment Needs

Inventory of Existing Data

This effort consisted of compilation of all available data related to the analysis of the transmission system, on maps at a scale of 1"=2,000'. The data displayed included:[1]

- Planning area and sewersheds
- Sewer service categories
- Existing and proposed treatment plants, pumping stations, and program size sewers
- Stations where existing sewage flow has been monitored
- Peak transmission capacities of existing pipes.

Washington Suburban Sanitary Commission's mini-basin maps, developed as a part of the Infiltration and Inflow Study, were compiled to generate a detailed comprehensive systems map. The above-mentioned mini-basins are keyed into two very important Sanitary Commission's computer programs:

- SSCAN[2]
- Average Daily Consumption by Account

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[1] Based on map supplied by Montgomery County Office of Environmental Planning.

The computer program SSCAN[2] provides information relating to outstanding commitments, amount of flow, date of approval, current status, and location. As soon as a hook-up is provided for a given commitment, it is dropped from the monthly print-out of SSCAN.

Compared to SSCAN, the Daily Average Comsumption Program provides for average daily water consumption by account.

An account may be defined as a classification of water use, such as residential, commercial, industrial, garden apartment, high-rise apartment, or Federal Government use, etc.

With a slight modification in the software of the above two programs, an excellent opportunity exists for the simulation of peak flows at key locations. These simulated peak flows could be checked against existing peak capacities of sewers to determine hydraulic conditions.

If developed, this program would provide the County with an invaluable planning tool not only in decisions related to Capital Improvements Program (CIP) projects, but also in assessing major options related to County growth policy. In cooperation with the Montgomery County Planning Board (MCPB), WSSC could develop a system to report commitments by traffic zones. This would be a valuable aid to Adequate Public Facilities (APF) analysis.

It is recognized that for accurate calibration of the model one would need adequate field information on infiltration and inflow, along with the physical conditions of the existing pipe.

---

2 Sewer Service Capacity Analysis Network

Analysis of Transmission System

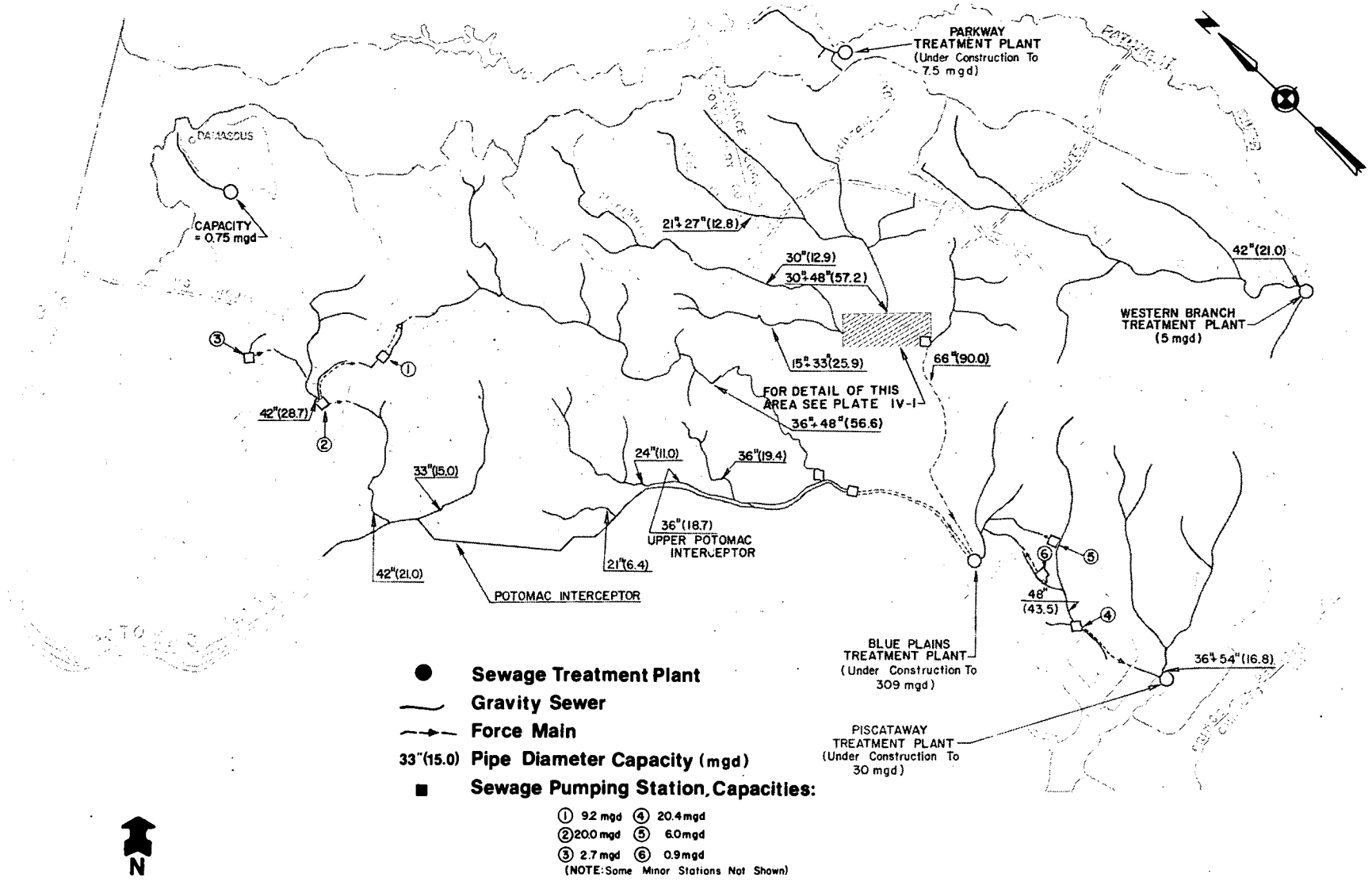
When the quantity of the sewage flow exceeds the peak hydraulic capacity of the pipe, backup or sewerage overflow results. This phenomenon is commonly referred to as transmission or hydraulic constraints. In Montgomery County, three basins which have severe-to-limited transmission constraints are Little Falls, Anacostia, and Rock Creek. Of the above three, Anacostia and Little Falls Basins are still under the State's sewer moratorium. Recently the State has agreed to the allocation of 4 mgd of capacity in Rock Creek Basin be charged against cessation of pumpover from Muddy Branch. This will ease the transmission constraints in Rock Creek, so long as the flow at the D.C. line does not exceed the allowable 56.60 mgd. Due to delays in the construction of relief projects in Prince George's County and the District of Columbia, permanent relief in the Anacostia Basin is not expected prior to 1981.

In order to evaluate pipeline commitments, overlays which depict the quantity and geographical distribution of commitments over the major sewersheds were developed. These overlays, along with the base maps discussed earlier, were used in the development of Table 5.1. This type of analysis is suitable for planning purposes and is general in nature. Actual monitored flow data was obtained from the County Office of Environmental Planning.

The adequacy of sewers refer only to the hydraulic capacity and is applicable only for the given station. It is probable that the hydraulic capacity may considerably exceed or fall short of the calculated capacity between two known stations, depending upon the slope and the size of the pipe.

The flow generation factors, recommended in the Ten-Year Water and Sewerage Plan, were used in Table 5.1.

REGIONAL WASTEWATER FACILITIES



SOURCE: STATE OF MARYLAND
POTOMAC-METROPOLITAN AREA WATER QUALITY MANAGEMENT PLAN

FIGURE 5.1

TABLE 5.1

SEWER SYSTEM - MONTGOMERY COUNTY

ADEQUACY ANALYSIS OF EXISTING TRANSMISSION SYSTEM

BASIN	TRUNK SEWER	CHECK POINT #	COMMITMENTS									AVERAGE FLOW MGD			PEAK FLOW MGD		PIPE ADEQUACY				C.I.P. PROJECT NO. *****
			Domestic						Commercial & Industrial												
			S. F. D. U		Apt.		Town House														
			UNITS	MGD	UNITS	MGD	UNITS	MGD	ISSP	WSSC	ROCK CREEK CONSORTIUM	MONITORED	INCREMENT COMMITMENT	TOTAL	AVERAGE PIPE CAPACITY	EXISTING PLUS COMMITMENT	PIPE	NOT ADEQUATE	ADEQUATE	ADEQUATE WITH POSSIBLE SURCHARGING	
									Gallons												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
MUDDY	M.Branch	0	590	0.236	162	0.053	272	0.102	207,119	66,000	-	4.60	4.775	9.375	9.9	11.35	20.8		x		105.02
SENECA	Seneca	75.2	948	0.379	496	0.164	3069	1.151	81,639	449,300	-	2.5	2.22	4.72	4.3	11.35	10.55			x	
		63.1 ****	1200	0.480	7129	2.353	5552	2.082	190,492	491,700	-	2.70	4.495 **	7.20	4.8	10.9	11.55	x			84.05, 82.00
		56.7	1327	0.530	7129	2.353	5834	2.188	254,237	493,300	-	4.40	4.715	9.115	14.3	11.3	19.5		x		82.03, 53.04
ROCK CREEK	Rock	60.9	2192	0.877	-	-	654	0.245	178,412	93,900	54,415	8.10	1.449 ***	6.549	20.0	14.80	40.00		x		49.3
	Creek	41.00	2227	0.891	250	0.083	663	0.249	244,052	325,800	110,280	12.50	1.93	11.43	15.3	23.5	30.80		x		49.3
		33.8	2304	0.922	400	0.132	712	0.267	294,050	371,100	518,932	16.4	2.575	15.9	19.1	31.8	38.2		x		49.3
		22.3	2314	0.926	416	0.137	717	0.269	317,470	450,200	522,932	20.00	2.651	19.65	16.80	39.3	33.6	x			49.3
		14.6	2320	0.928	-	0.137	717	0.269	370,903	502,140	522,932	25.4	2.769	25.69	20.8	51.38	41.6	x			97.01
		11.3	2610	1.044	-	0.137	846	0.317	425,723	544,940	522,932	27.4	3.02	27.42	21.7	54.8		x			
		0	2623	1.049	1802	0.595	846	0.317	504,565	580,140	546,271	29.5	3.62	30.12	26.0	60.29	52.0	x			49.06
ANACOSTIA	Paint	41.2	206	0.082	-	-	-	-	48,878	8,153	-	1.7	0.138	1.84	3.5	5.15	9.0		x		
	Branch	27.0	208	0.083	1212	0.40	78	0.029	52,936	28,153	-	2.30	0.59	2.89	3.1	7.6	9.0		x		33.3
	No.West	54.1	358	0.143	700	0.231	795	0.298	7,036	86,700	-	2.50	0.765	3.265	3.8	8.5	9.9		x		91.2
	Branch	43.2	366	0.146	1140	0.376	795	0.298	8,639	88,100	-	2.80	0.915	3.715	3.7	9.2	9.2		x		
	Sligo	32.8	3	0.001	-	-	61	0.0229	111,027	7,100	-	2.50	0.042	2.54	6.7	6.85	20.0		x		98.04
	Creek	15.7							146,592	50,400	-	7.20	0.19	7.39	7.2	16.25	16.25		x		49.06
ROCK RUN	Rock Run	0.3	104	0.041	-	-	-	-	7,856	10,100	-	0.3	0.06	0.36	1.8	1.31	5.15		x		

* Includes 4.115 MGD from Seneca Basin & Pump Over to Rock Creek

** 5.00 MGD Tapped by Seneca Interim Treatment Plant

*** Includes Pumpover from Rock Creek and Olney & Tapping 3.00 MGD for Rock Creek Consortium

**** Adjustment for Germantown

***** Proposed C.I.P. Project. Transmission capacity of this project not included in the calculations.

TABLE 5.1 (continued)

SEWER SYSTEM - MONTGOMERY COUNTY

ADEQUACY ANALYSIS OF EXISTING TRANSMISSION SYSTEM

BASIN	TRUNK SEWER	CHECK POINT #	COMMITMENTS									AVERAGE FLOW MGD			PEAK FLOW MGD		PIPE ADEQUACY				
			Domestic						Commercial & Industrial												
			S. F. D. U.		Apt.		Town House														
			UNITS	MGD	UNITS	MGD	UNITS	MGD	ISSP	WSSC	ROCK CREEK CONSORTIUM	MONITORED	INCREMENT COMMITMENT	TOTAL	AVERAGE PIPE CAPACITY	EXISTING PLUS COMMITMENT	PIPE	NOT ADEQUATE	ADEQUATE	ADEQUATE WITH POSSIBLE SURCHARGING	C.I.P. PROJECT NO.
									Gallons												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
WATTS	Watts	42.1		-	-	-	-	-	52,460	6,200	-	0.4	0.059	0.459	1.9	1.65	5.3		x		
		35.1	1	0.0004	-	-	-	-	52,460	304,600	-	1.7	0.36	2.06	3.4	5.62	8.7		x		
		3.5	401	0.16	-	-	-	-	-	306,900	-	2.7	1.296	3.996	8.2	9.94	17.96		x		
LITTLE FALLS	Little Falls	4.4	7	0.003	-		-		78,705	-	-	1.9	0.08	1.98	1.2	5.6	3.69			x	102.03
		6.8	7	0.003	300	0.099	-	-	148,219	1,700	-	1.4	0.25	1.65	5.8	4.74	13.5		x		102.02
		5.2	103	0.041	300	0.099	-	-	159,379	1,700	-	4.0	0.30	4.30	17.2	10.75	38.5		x		
		0	121	0.048	300	0.099	-	-	195,379	4,100	-	4.8	0.31	5.11	6.8	11.94	15.38		x		102.04
CABIN JOHN	Cabin John	55.2	9	-	-	-	-	-	4,260	222,000	-	2.1	0.23	2.33	2.1	6.3	5.9		x		103.05
		47.5	219	0.087	1424	0.47	766	0.287	82,477	288,600	-	4.4	1.216	5.616	5.5	13.1	12.9			x	103.05
		31.0	497	0.199	1759	0.58	1052	0.394	85,297	301,700	-	6.8	1.56	8.36	6.9	18.3	15.5	x			103.05
		0	1026	0.4104	-	0.58	1120	0.420	134,169	358,300	-	10.7	1.9	2.6	6.3	25.77	14.5	x			103.05

1. Major Basin
2. Name of the trunk sewer
3. Station # where monitored flow data was available
4. Commitment of flow to number of single family dwelling units.
5. Flow in mgd due to single family dwelling units - Col. 4 x 400
6. Commitment of flow to number of Apartments
7. Flow in mgd due to Apartments - Col. 6 x 330
8. Commitment of flow to Town Houses
9. Flow in mgd due to Town Houses - Col. 8 x 375
10. Commercial and Industrial flow commitment as per ISSP
11. Commercial and Industrial flow commitment as per WSSC's W1
12. Commercial and Industrial flow commitment as per Rock Creek Consortium
13. Actual monitored average flow mgd
14. Added average flow due to commitments. Sum of Columns 5,7,9,10,11 & 12
15. Sum of Columns 13 and 14
16. Theoretical hydraulic capacity of pipe based on given slope and size
17. Column 15 multiplied by peaking factor
18. Column 16 multiplied by peaking factor
19. Hydraulic capacity of pipe less than incoming sewerage flow
20. Hydraulic capacity of pipe greater than incoming sewerage flow
21. Hydraulic capacity of pipe slightly less than incoming sewerage flow
22. Capital Improvement Project number of relief or replacement sewer

These factors are:

400 gallons per day - Single Family Dwelling Unit
375 gallons per day - Townhouse
330 gallons per day - Apartment

It should be noted that these factors have a built-in provision for infiltration and inflow.

The staff of the Water Resources Planning Board at the Council of Governments is utilizing a slightly different methodology for computing sewerage flows. Their flow factors for Montgomery County are:

Domestic Flow - 100 gallons per person per day
Commercial and Industrial - 52 gallons per employee
Infiltration - 25% of total of Domestic and Commercial and Industrial

Peaking factors given in the Ten-Year Water and Sewerage Plan were used to convert average flows to peak flows.

An examination of this data reveals that some of the CIP projects could be postponed, based on hydraulic capacity criteria only.

The above analysis was limited in scope, and applies only to those commitments already in the pipeline (approved commitments). A similar analysis based on pre-pipeline commitments, (applications awaiting for availability of capacity), Montgomery County growth forecasts (trend and intermediate), and ultimate holding capacity would be useful for the staging of the sewerage system in concert with other community facility needs.

Such an analysis, aside from its extreme usefulness in the review of CIP projects, would provide a better mechanism for establishing the sewer envelope and the review of category changes.

Analysis of Treatment Needs--Post Pipeline

Using the Planning Board's intermediate and trend forecasts in conjunction with the flow generation factors used by the staff of WRPB in the 208 process, treatment needs for the County range between 30 to 40 mgd as shown in Table 5.2.

The major interim treatment plants in the County could provide a treatment capacity up to 10.50 mgd in Montgomery County as shown in Table 5.3. If a hypothetical assumption is made that these plants would continue beyond 1995, the needs of the County could be reduced by another 10.5 million gallons per day as illustrated in Table 5.4. Based on the above table the County's mid-term need for 1985-1990 would range in the vicinity of 20 mgd.

TABLE 5.2*
SEWERAGE TREATMENT CAPACITY NEEDS OF MONTGOMERY COUNTY IN MILLION GALLONS PER DAY

Year	Expected Flow	Montgomery County's Share of Blue Plains Capacity	Future Needs
1980	83.80	76.60	7.2
1985 I	96.20	76.60	19.6
1985 T	102.70	76.60	26.1
1990 I	101.10	76.60	24.5
1990 T	110.60	76.60	34.0
1995 I	108.50	76.60	31.90
1995 T	117.40	76.60	40.80

* Based on COG Data
I Intermediate Forecast
T Trend Forecast

TABLE 5.3
TREATMENT CAPACITIES OF MAJOR INTERIM PLANTS IN MONTGOMERY COUNTY

Damascus	0.75
Rossmoor	0.25
Seneca	5.00
Montgomery Village	1.50
Rock Creek	3.00
Total Interim Capacity	10.50

TABLE 5.4

TREATMENT CAPACITY NEEDS OF MONTGOMERY COUNTY ASSUMING MAJOR INTERIM TREATMENT PLANTS WOULD CONTINUE BEYOND 1995

YEAR	CAPACITY NEEDS MGD
1980	+ 3.2
1985 Intermediate	- 9.2
1985 Trend	-15.7
1990 Intermediate	-14.1
1990 Trend	-23.6
1995 Intermediate	-21.50
1995 Trend	-30.40

Conceptually there are numerous ways in which these additional treatment capacities could be provided. Alternate solutions are classified in three broad categories:

Local solutions which could be implemented locally, bi-County solutions which need agreement with Prince George's County, or regional solutions such as those being discussed at the Water Resources Planning Board.

Table 5.5 highlights the alternate possible solutions to meet the County's treatment needs.

From Table 5.5 it appears that both local and regional solutions could meet individually, in conjunction with each other, and with combination with the bi-County solutions to provide for the County's mid-term needs. Local solutions provide a broad spectrum of measures and maximum degree of flexibility.

Sewerage Impact Assessment Conclusion

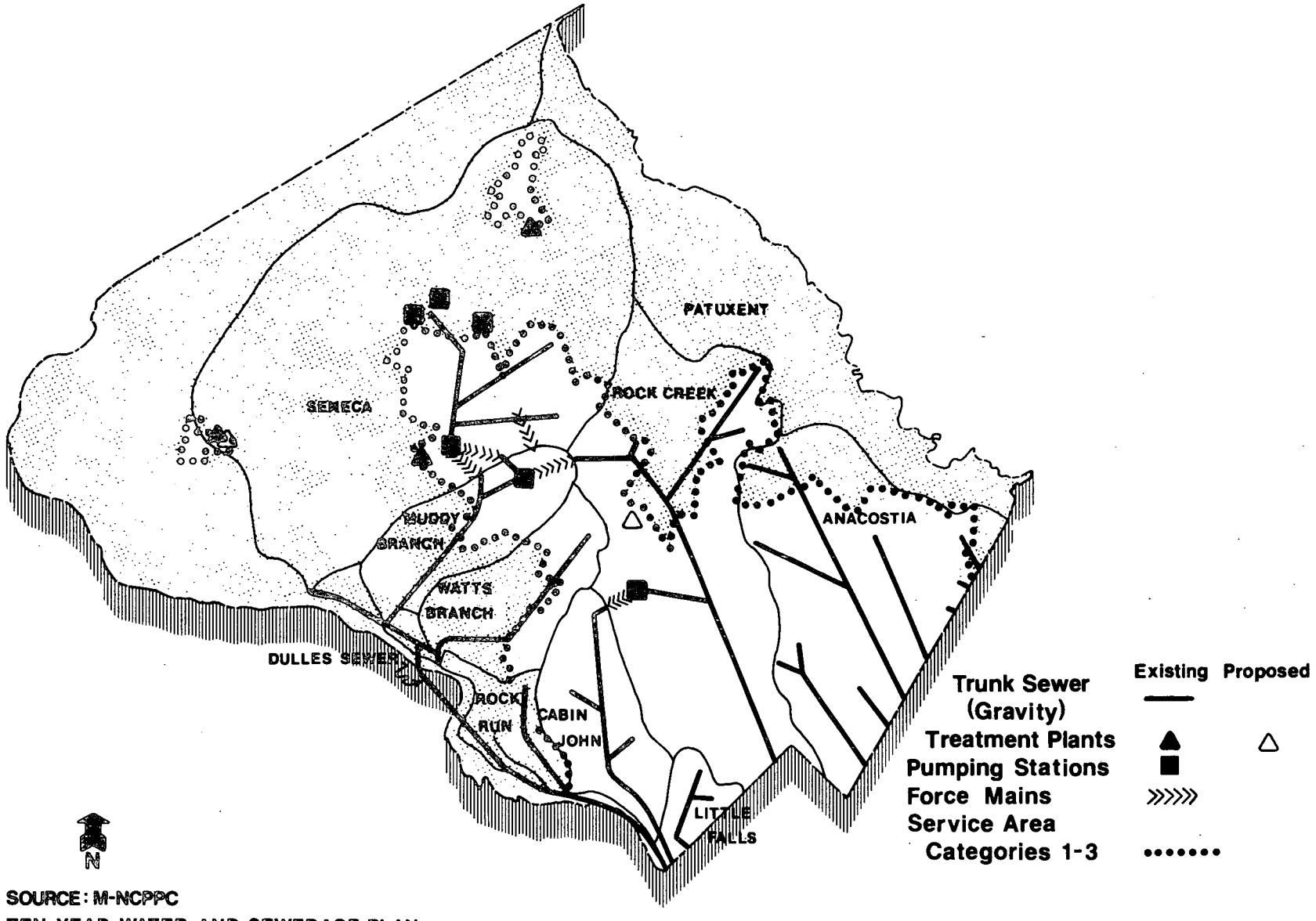
- A computerized model of the capacities of the transmission network would be extremely valuable to the further refinement of the Adequate Public Facilities Concept. WSSC"S existing computer programs, such as SSCAN, should be utilized to their maximum capability to simulate future average and peak flows. Such a program would provide the decision makers with a better tool for the planning of CIP projects, and implementation of the Adequate Public Facility Concept.

- Based on the demonstration transmission analysis, it appears that some of the CIP projects could be delayed on the basis of available transmission capacity.

- Existing treatment capacity is sufficient for the growth anticipated by both the "pipeline" and the intermediate forecast through the early 1980's. Additional treatment capacity is required for the period beyond this.

- Both local and regional treatment capacity solutions by themselves, or in combination with each other, or with the bi-County solutions, could meet the County's mid-term needs.

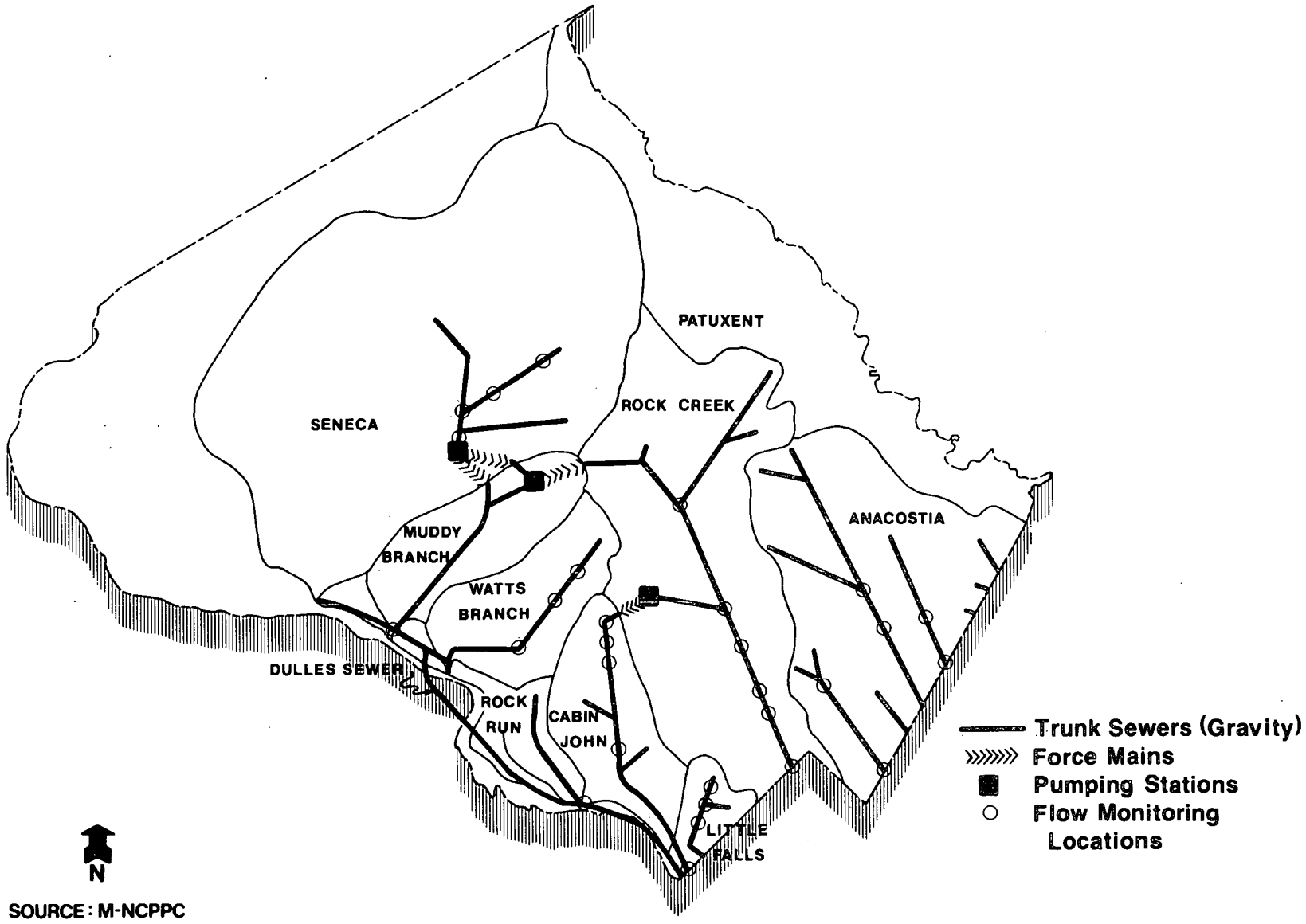
Major Elements of the Montgomery County Sewerage System



SOURCE: M-NCPPC
TEN YEAR WATER AND SEWERAGE PLAN

FIGURE 5.2

Montgomery County Sewerage System
Generalized Locations of Flow Monitoring Data



SOURCE: M-NCPPC
TEN YEAR WATER AND SEWERAGE PLAN

FIGURE 5.3

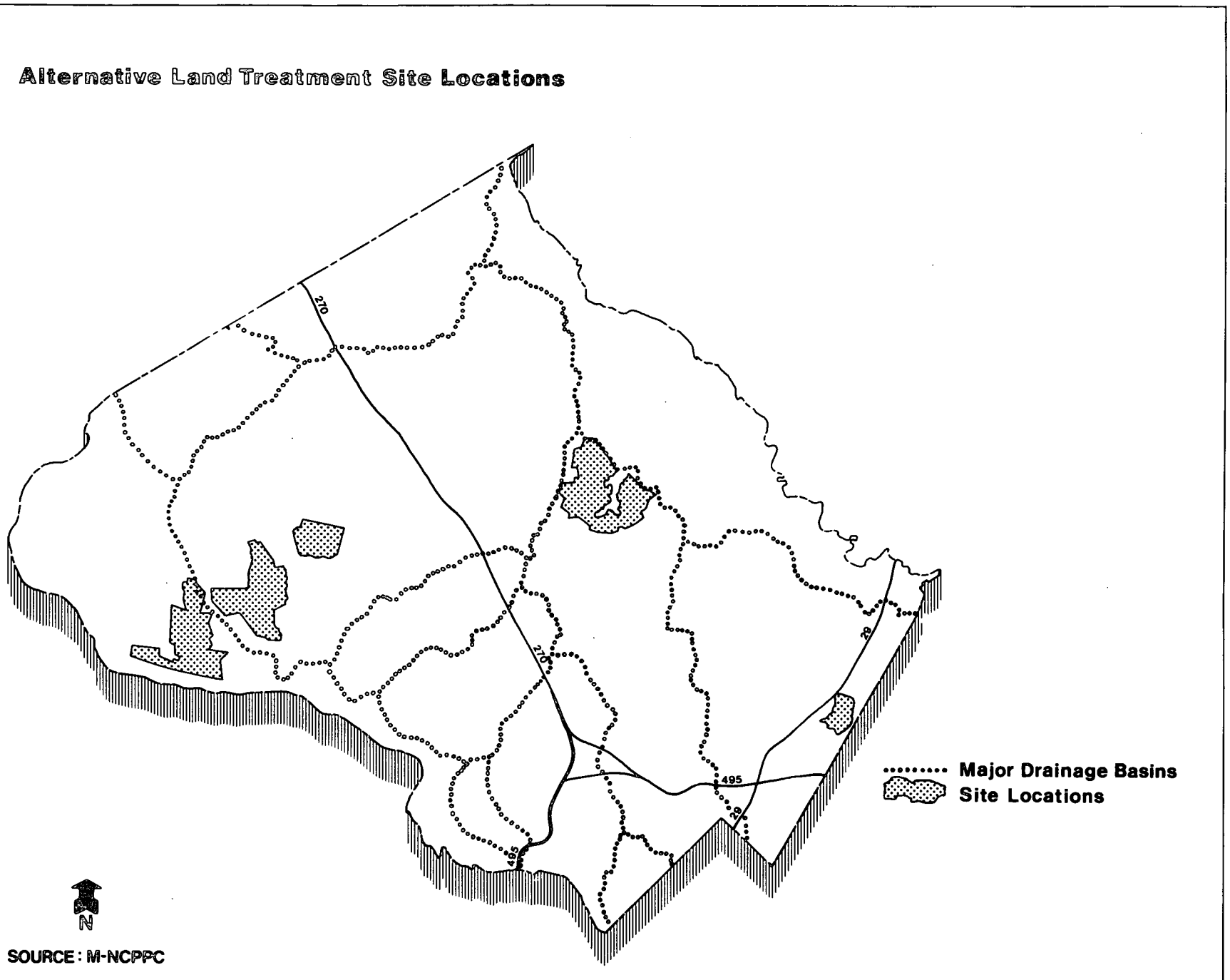

Alternative Land Treatment Site Locations
270
210
495
28
Major Drainage Basins
Site Locations
N
SOURCE: M-NCPPC

FIGURE 5.4

- Alternative solutions to treatment constraints that could be implemented with decisions at local levels are both flexible and represent a broad spectrum of measures (see Table 5.5).

WATER SUPPLY

Background

In recent years, there have been a large number of studies undertaken to address the water supply needs of the Washington Metropolitan Area. Since this area is strongly dependent upon the Potomac River, the main issues involve governments' desire to protect this supply and to appropriate and store more of it to serve growing demands, and for emergency use as well.

A number of alternatives, combining various measures to meet future water demand in the Washington Metropolitan Area, have been proposed by the Army Corp of Engineers, which presented such information in a report entitled "Critical Choices for Critical Years." November, 1975. This interim report is a part of the Northeastern U.S. Water Supply Study (NEWS). Further analysis and details will be forthcoming as the study continues.

Bi-County Water Supply Study

The most recent study of local needs and alternatives is proceeding into the final phase, as the consultants to the Bi-County Water Supply Task Force commence an evaluation of seven (7) alternatives selected from a much longer list. Other parts of the study, completed in the past years, include reports on supply and demand, and formulae for obtaining deficits. With this information, it will be possible to determine anticipated needs well in advance and decisions can be made now as to how projects will be staged and whether facility designs

TABLE 5.5

MONTGOMERY COUNTY SEWAGE TREATMENT NEEDS
ALTERNATE SOLUTIONS

LOCAL SOLUTIONS	BI-COUNTY SOLUTIONS	REGIONAL SOLUTIONS
1. Implement measures to reduce I & I.	1. Purchase of available Blue Plains capacity from Rockville and Prince George's County.	1. Construction of Regional AWT in Montgomery County to meet the needs of Montgomery County, Virginia, and D.C.
2. Land treatment would help treatment as well as transmission constraints.		2. Expansion and/or rerating of Blue Plains. Preliminary water quality analysis by COG staff has indicated that water quality does not vary significantly with varying outlet locations. Consequently factors other than water quality will play a major role in the selection process such as: a. cost b. practicability c. political consideration.
3. Construction of AWT to meet the County's treatment needs.		3. Expansion of Piscataway. -An expansion of Piscataway from existing 30 mgd to probable 60 mgd treatment capacity.
4. Expansion of Seneca Interim plant.		4. Combination of above three solutions.
5. Construction of Anacostia Interim plant.		
6. Paper Capacities a. Reevaluation of flow generation factors. b. Assume greater risk for overflow. c. Recapture of W_1 commitments given at 500 gallons per dwelling unit and reallocation of capacities at 400 gallons per dwelling unit. d. Examination of rate structure. e. Incentives for water saving. f. Restrictions on the usage of water consumption devices such as garbage disposal.		

will attempt to meet all the predicted need and what benefit/cost ratios are feasible or acceptable.

For determining future demands, the WSSC consultant has utilized population forecast data provided by the Planning Board for both the intermediate and trend forecast. Unlike the traditional approach of developing demand on the basis of population, the consultant has derived regression equations for water supply demand on the basis of household income, average gross area per dwelling unit, moisture deficit, occupancy per dwelling unit and zip code. Although the coefficient of correlation is low, this approach, conceptually, is more scientific than the traditional empirical approach currently in use.

The consultant's study has indicated that with the implementation of drought management techniques the existing water supply resources could meet 1985 demand, assuming that the current and expanded intake facilities are on in line. Since the pipeline development is expected to fall in the pre1985 period, no further attempt was made in this report to further evaluate the impact of pipeline development on the water supply problem.

P.L. 566 - LAKE SITE #3

The preliminary investigation report on P.L. 566 indicates that, in addition to its flood control and recreation benefits, and its public acceptability, Lake Site #3 has meaningful potential for providing an emergency water supply. It can provide 8,640 acre feet (2.82 billion gallons) of storage in times of extreme emergencies. Hydraulics of the spillway suggests that a maximum release of 190 mgd is possible, of which 155 mgd could be expected to reach WSSC intake. It is expected that this maximum flow could be sustained for about 14 days. A final report, along with the Environmental Impact Statement, is due early next year.

Ground Water Supply

The United States Geological Survey in cooperation with the State of Maryland, Montgomery County, and the town of Poolesville has undertaken a study to evaluate the underground water resources of the western part of the County. This study is expected to be complete within two years.

Water Supply Impact Assessment Conclusion

Water supply will be adequate for the pipeline development with the implementation of drought management techniques as required. Many of the problems and issues concerning local water supply are related to long-term solutions proposed for the region. Lake Site #3 provides adequate storage capacity for emergency water supply.

STORMWATER

Background

The responsibility for stormwater planning and enforcement in the County is shared by The M-NCPPC, the Montgomery County Department of Environmental Protection, the Montgomery County Department of Transportation, and the Montgomery Soil Conservation District. The following basin plans have been completed, or represent presently ongoing efforts:

1. "A Functional Master Plan for Conservation and Management in the Seneca Creek and Muddy Branch Basins" - M-NCPPC. This plan includes resource inventories, and floodplain maps for existing and ultimate land use based upon watershed simulation.

2. "A Comprehensive Stormwater Management Study for the Anacostia River Basin in Prince George's and Montgomery Counties, Maryland" - M-NCPPC. This plan includes floodplain maps based upon watershed simulation.

3. "Watts Branch Watershed Stormwater Management Concept Plan (Draft)" -DEP.

4. "A Functional Master Plan for Conservation and Management in the Rock Creek Basin" (Ongoing Study) - M-NCPPC. This study will include floodplain maps, for existing and ultimate land use based upon water simulation and resource inventories.

In addition to the above-mentioned floodplain maps, in the absence of watershed simulation, the U.S. Department of Housing and Urban Development has completed a series of floodplain maps for existing land use for selected streams throughout the County.

Current Status of Stormwater Management at the State Level

The Montgomery Soil Conservation District, by virtue of the Maryland Sediment Control Act of 1970, administers a sediment control program for Montgomery County which includes a stormwater management policy requiring the on-site detention of the postdevelopment two year storm to be released at pre-development two year rates.[3]

Recently, House Bill 839 was incorporated within the Natural Resources Article for the purposes of providing

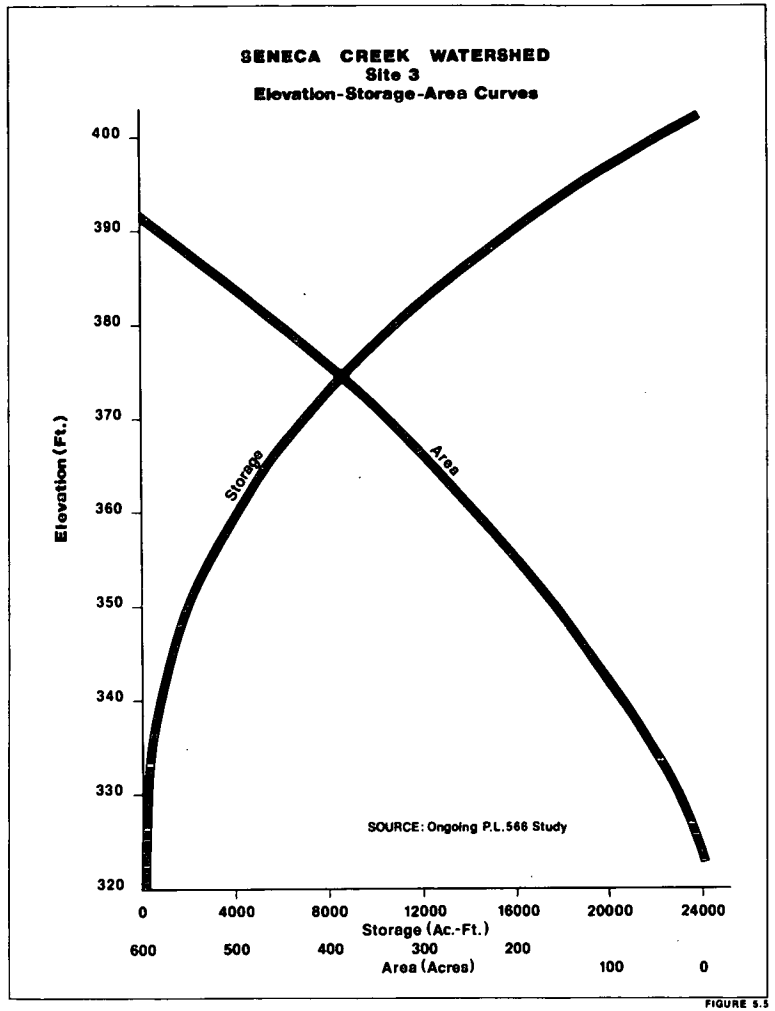


FIGURE 5.5

a procedure for determining interim flood hazard areas; a system for developing rules and regulations governing uses within flood hazard areas; a procedure for establishing and implementing management programs for the several watersheds of the State; defining various

[3] This policy affects sites 5,000 square feet or greater, with specified exemptions and waivers.

terms; establishing the responsibilities of various persons and agencies; providing for penalties; and generally relating to flood control and watershed management.

Current Status of Stormwater Management at the Regional Level

The Washington Metropolitan Council of Governments, in its ongoing 208 planning process (due April, 1978), is investigating various strategies for addressing non-point source loadings of waterways. Action plans for stormwater quality management, including workload allocations, are anticipated for future County implementation.

Stormwater Impact Assessment Conclusion

- Stormwater management needs are not directly related to population growth, but rather to the logistics of imperviousness and other hydrologic characteristics within a basin's existing and ultimate land use mix. Therefore, the stormwater runoff and associated problems from incremental pipeline development can be handled by existing County policies.

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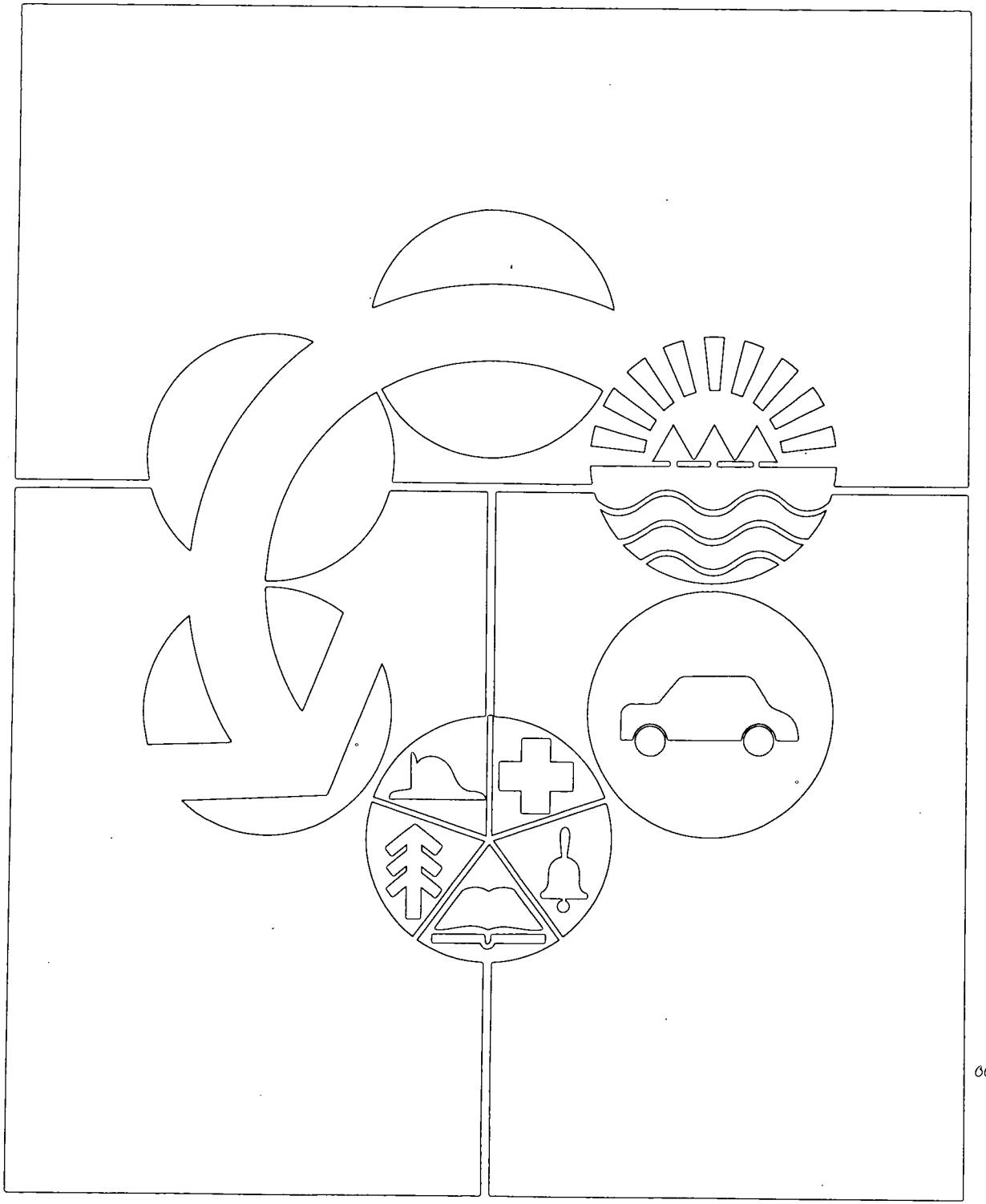
[3] This policy affects sites 5,000 square feet or greater, with specified exemptions and waivers.

- Low-density development of headwaters of watersheds.
- Existing flexible policy of onsite-offsite stormwater management for new development, unless higher levels of protection are demonstrated as necessary.
- Aggressive maintenance program for stormwater management facilities.
- Development of comprehensive basin studies and plans for all of the County's major basins.



Chapter Six

IMPACT of "PIPELINE" on TRANSPORTATION FACILITIES

CHAPTER VI

IMPACT OF "PIPELINE" ON TRANSPORTATION

SUMMARY

This chapter assesses the relationship between the amount of new growth in the "pipeline" and the capacity of programmed road and transit facilities. It consists of four parts. First, existing levels of service are determined for the highway system, using several new tools developed by Planning Board staff. Second, the impact of traffic generated by the "pipeline" and by forecasted employment growth are analyzed. Next, this impact assessment is translated into recommendations for future State and County road improvement programs. Lastly, a concept for managing growth by examining traffic on a macro traffic shed level is outlined.

The existing highway level of service analysis reveals a significant number of intersections currently operating at low levels of efficiency. Under highway impact assessment, it is found that excess congestion is concentrated in the I-270 Corridor with lessor concentrations on upper U.S. Route 29 and upper Georgia Avenue. Intersections related to the corridor between Gaithersburg and Rockville are the most heavily impacted.

Under CIP recommendations, the higher priority projects coincided with growth in the I-270 Corridor, including improvements to Route I-270 and interchanges, the Eastern Arterial, and Rockville Facility/Intercounty Connector.

Under growth management, the concept presented focuses on measuring the impact of growth at an aggregated scale rather than on a subdivision-by-subdivision basis. A transportation model would be used to analyze the impact of incremental growth on marginal and critical transportation links. Limitations would be placed on growth within specified traffic sheds, if connections could be traced to adversely impacted highway links. These limitations would be removed as transportation improvement projects were programmed to eliminate critical situations.

EXISTING HIGHWAY LEVELS OF SERVICE

The vast majority of highway carrying capacity is already in place to serve the transportation demands of existing population and employment in the County. The incremental growth examined by this report will make marginal changes to the overall system. It is, therefore, very important to be able to accurately measure and understand existing transportation patterns and deficiencies. Several new analytical tools are now available to assist in understanding present conditions.

The first new tool relates to the measurement of PM peak-hour level of service (LOS) at intersections throughout the County. The critical lane volume (CLV) summation methodology is used to measure the LOS at the intersections. The methodology itself is not new and in fact has been used extensively in analyzing subdivision cases under the Adequate Public Facilities Ordinance, in sector plan analysis and in zoning cases. What is new is that over 400 intersections have been analyzed at one time and a clear County-wide pattern is now available.[1] In cooperation with the Montgomery County Department of Transportation (MC DOT) the inventory of intersection LOS calculations will be continuously updated.

A second tool is provided by the Maryland Department of Transportation (Md DOT). They have conducted aerial surveillance of the Maryland portion of the I-495 Beltway. A traffic engineer has observed and rated the level of service on the approach road to Beltway interchanges and of the Beltway links during peak and off-peak periods.[2] The ratings correspond to the LOS A through E range associated with peak-hour level of service at interchanges and on I-495. It is recommended that this important work be extended to cover the I-270 Corridor.

The third tool now available deals with the analysis of average daily traffic (ADT) volumes. The tool is the computer graphic plotting capacity of the transportation model developed under the Corridor Cities Transportation Impact Study (CCTIS).[3] Existing daily volumes as compiled from MC DOT, Md DOT and other sources are graphically displayed by ban-width plots for a County-wide network. The model is also capable of computing and plotting volume to capacity (V/C) ratios and percentage increase in assigned volumes resulting from simulation tests for varying land use and transportation alternatives.

The results of these three new analytic tools have been combined to determine existing LOS conditions for roadways in the County. The analysis is weighted toward PM peak-hour conditions which constitute the most critical conditions County-wide. The analysis has been generalized to portray adequate, marginal, and critical sets of intersections and connecting links. An adequate rating equates to LOS A, B, C conditions, marginal to LOS D, and critical to LOS E, F. The results are portrayed on Figure 6.1.

The pattern which stands out on Figure 6.1 is the critical and marginal LOS conditions on the major radial corridors at and inside the I495 Beltway. Also the cross-county links of East-West Highway, Randolph Road, and I-495 show critical and marginal levels of service. The worst intersection conditions occur when high volume radially oriented traffic crosses the high volume cross-county corridors.

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1 PM Peak Hour Level of Service Project conducted by JHK and Associates for M-NCPPC, September, 1977.

2 Aerial Surveillance of the Baltimore and Washington Beltways, Md DOT, March, 1977.

3 CCTIS Model developed by Comsis Corporation in cooperation with COG for M-NCPPC 1976-1977.

The peak-hour examination indicates that there is currently adequate LOS on most highways extending from the urbanized area into the suburban and rural areas. This is true of River Road outside the Beltway; Route 28 west of I-270; Route 355 north of Gaithersburg; Georgia Avenue north of Norbeck Road; and New Hampshire Avenue north of White Oak.

The purpose of identifying existing marginal and critical highways is two-fold. First, their identification will assist in determining priorities for expenditures of funds for highway improvements, transit services, and transportation system management (TSM) projects. Second, growth management requires an assessment of the relative impact of new development on the LOS at existing marginal and critical links which results from new development.

HIGHWAY IMPACT ASSESSMENT

For transportation systems analysis, the County has been subdivided into fifteen (15) transportation traffic analysis areas as shown on Figure 6.2. The pipeline dwelling units were then assigned to the areas and a first-cut analysis made. The major pipeline concentration is located in the I-270 Corridor from Bethesda to Germantown. Smaller concentrations are located in the upper U.S. Route 29 Corridor and upper Georgia Avenue Corridor. The transportation analysis focuses on the I-270, Georgia Avenue and U.S. Route 29 Corridors, with higher priority given to I-270. The incremental impact of residential development on the transportation systems of other areas of the County will be minimal.

The trip distribution pattern between transportation analysis areas was determined using the CCTIS transportation model for existing trip patterns. In addition to the 15 areas inside the County, there are 5 areas outside the County. They are the District of Columbia core; the District of Columbia; Prince George's County; Arlington and Alexandria; in Virginia. An examination of trip distribution in the I-270 Corridor showed a very strong radial orientation (see Figure 6.3). Also, the percentage of trips made within each area and to nearby areas was predominant over longer distance trips made to the District of Columbia and its core. As an example, 29 percent of Gaithersburg trips were internal to the analysis area with an additional 14 percent oriented to Rockville; compared to a total of 17 percent to District of Columbia and its core. The same radially oriented pattern exists for both the Georgia Avenue and U.S. Route 29 Corridors. There is, however, a cross-county influence with trips to employment centers in the I-270 Corridor and to Prince George's County.

The high concentration of commitments in the I-270 Corridor combined with a strong radial trip pattern suggests that the brunt of the impact of development will be in the I-270 Corridor. The incremental increase within the I-270 Corridor is greatest across a cordon line between Gaithersburg and Rockville. The increased volume across this cordon line is nearly twice the increase for trips crossing into District of Columbia and Virginia. In the lower part of the I-270 Corridor, a number of alternate travel routes are available including I-495, George Washington Parkway, River Road, Wisconsin Avenue, and Connecticut Avenue. The traffic impact in this area will be spread across all of these alternate routes. In contrast, the upper portion of the I-270 Corridor has only two major radial routes, I-270 and Route 355, to handle the incremental growth. The high incremental demand for increased capacity in the I-270 Corridor will be reflected in the recommendations for priorities in the State and County highway programs.

In the upper Georgia Avenue Corridor, the State Highway Administration's five-year construction pro-

V/C RATIO CALIBRATION

VMT ASSOCIATED WITH "1995" HWY NETWORK LEVEL OF SERVICE CONDITIONS

1/2

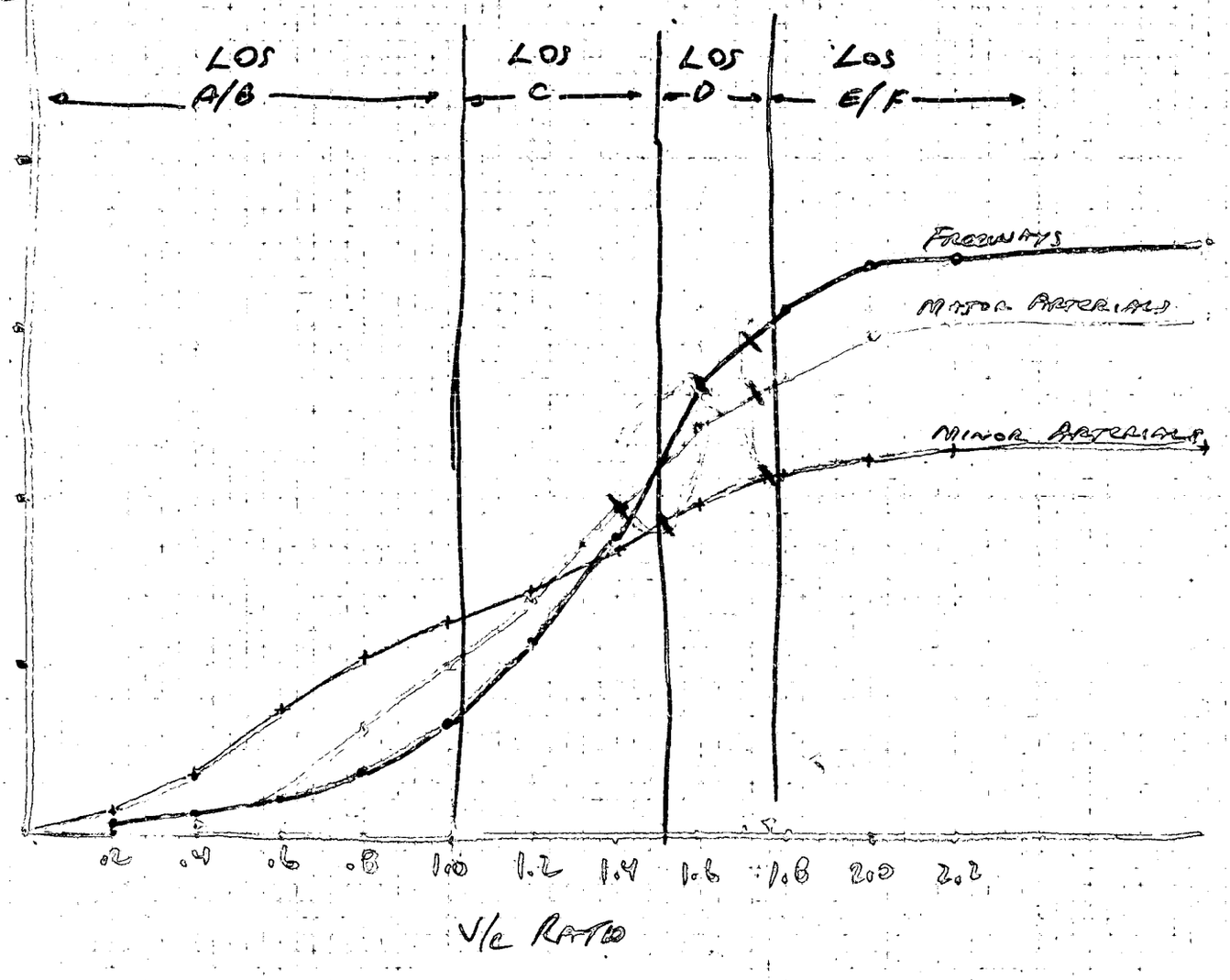
9/18/78

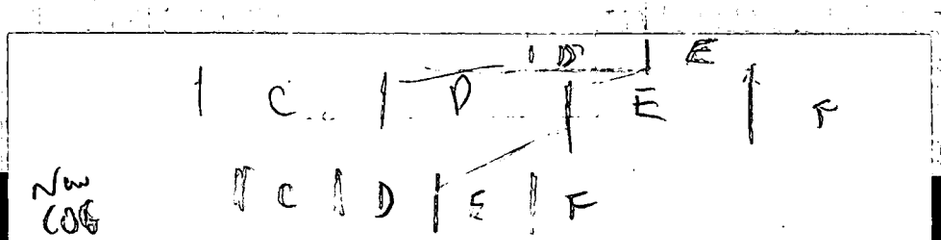
			LOS D	LOS E/F
Freeways	I-495	Wisc to Conn		1.6 × 110 = 176
		Conn to Ga		2.3 × 127 = 292.1
	270 Spur	±-27 to Wisc		2.5 × 50 = 125
	I-270	Spur to North	1.7 × 91 = 154.7	
		at MUA Dist.	.7 × 65 = 45.5	
				593.1
Major Arterial	US 29	N of White Oak to Four Corners	3.0 × 25 = 75	
		Dale to Four Corners		1.5 × 50 = 75
	NH Ave	N of Belt / S of Belt	.6 × 55 = 33	.9 × 50 = 45
	Ga Ave	S of Belt		.6 × 90 = 54
		N of Belt		.8 × 65 = 52
		N of Univ	1.6 × 50 = 80	
		Bel Pre to Norbeck		1.5 × 14 = 21
	Conn	E/W Bypass to Belt	1.3 × 60 = 78	
		N of Belt	.6 × 35 = 21	
		Kensington		1.3 × 30 = 39
		N of Viers Mill		.5 × 25 = 12.5
	Wisc/ Rockville Pike	Bradley to E-W	.6 × 50 = 30	
		E-W to Jones	.9 × 55 = 49.5	
		Jones to Cedar	.7 × 40 = 28	
		Grosvenor to Cedar	1.3 × 40 = 52	
		West to Rockville		1.4 × 50 = 70
		S of Rock	.7 × 40 = 28	

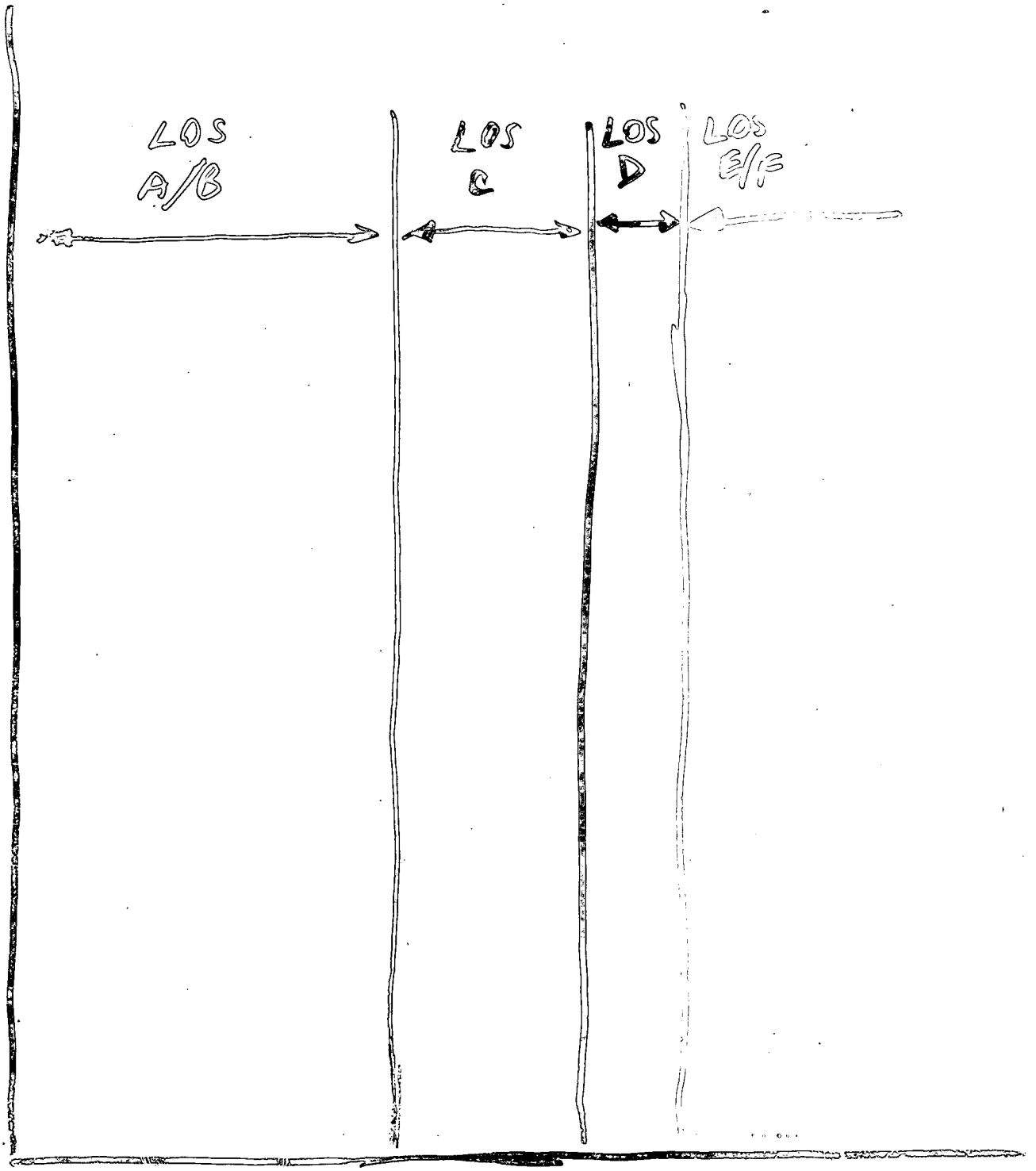
	LOS D		LOS E/F	
Fremont Ave SG to Whittier			2.1 × 30 =	63
MVA to SG	2.8 × 20 =	56		
Old Georgian to Beech	.7 × 30 =	21		
Glenoaks to Truck	1.3 × 35 =	45.5		
Rose Wilson to Walnut	3.4 × 30 =	102		
E-Wilbur Walnut to Cmn	1.0 × 25 =	25		
Cmn to Brand	.9 × 25 =	22.5		
Brand to 16TH	1.8 × 35 =	63		
16TH to Gr	.9 × 30 =	27		
Montrose 210 to Alta		137	2.2 × 35 =	77
Verdugo to Glendale			.6 × 20 =	12
Parkdale to Vista			1.4 × 30 =	42
Vista to Cmn			.6 × 25 =	15
		836.5 700		511.5 430
Monrovia Parkdale to 210	.6 × 30 =	18		
210 to Foothill	.7 × 25 =	17.5		
Turnbuckle Hwy			1.3 × 30 =	39
Mountain Ave 210 to 355	1.6 × 20 =	32		
355 to Monte	.5 × 30 =	15		
Shelby Grand 210 to 355	1.0 × 30 =	30		
Mt Olive Ave 210 to 355			.5 × 40	20
		112.5 250		59 200

1975

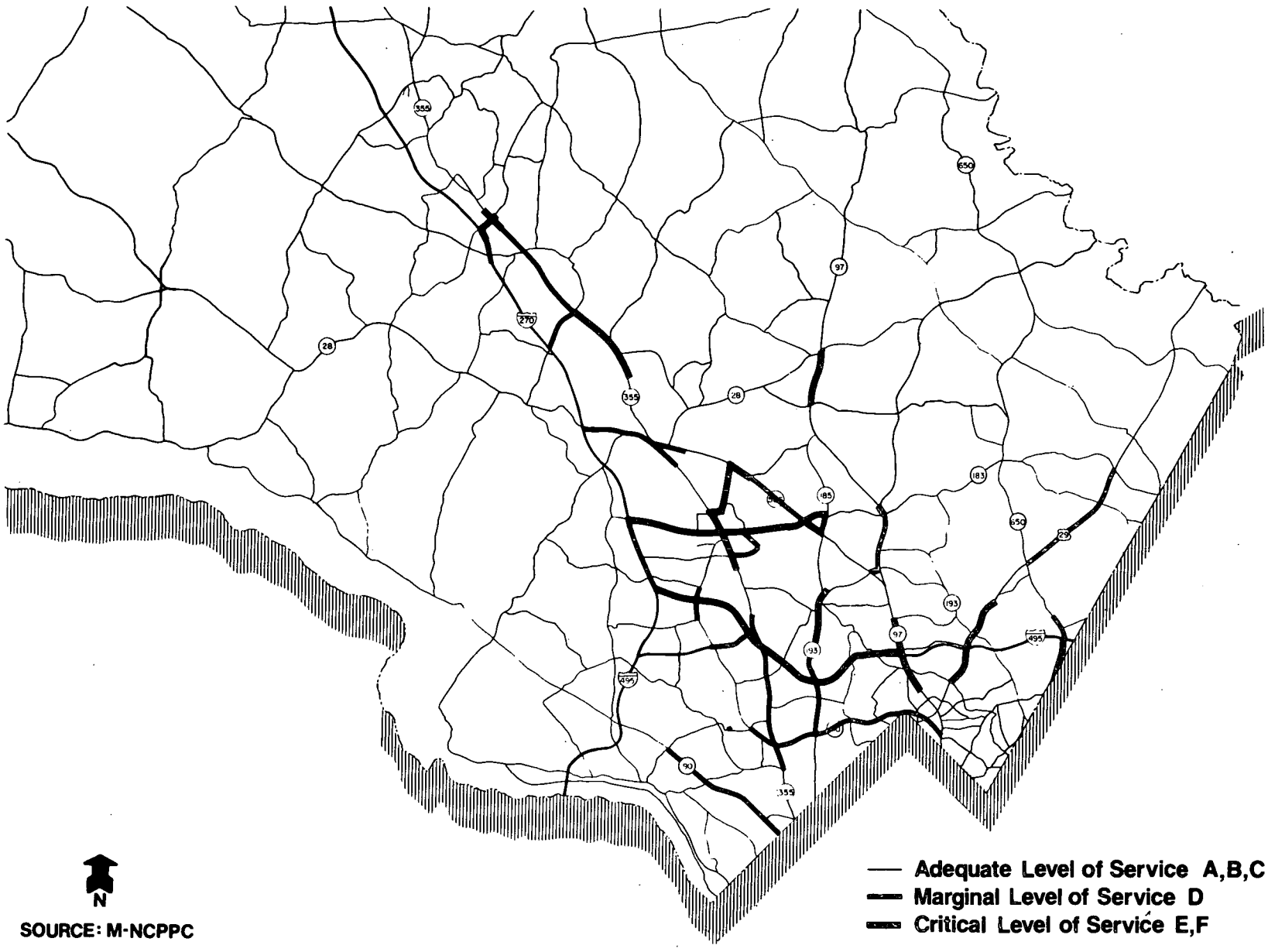
ABSOLUTE DISTRIBUTION OF VEHT by FUNCTIONAL CLASS






LOS
A/B
LOS
C
LOS
D
LOS
E/F

1977 Highway Network: Existing Level Of Service Conditions



SOURCE: M-NCPPC

FIGURE 6.1

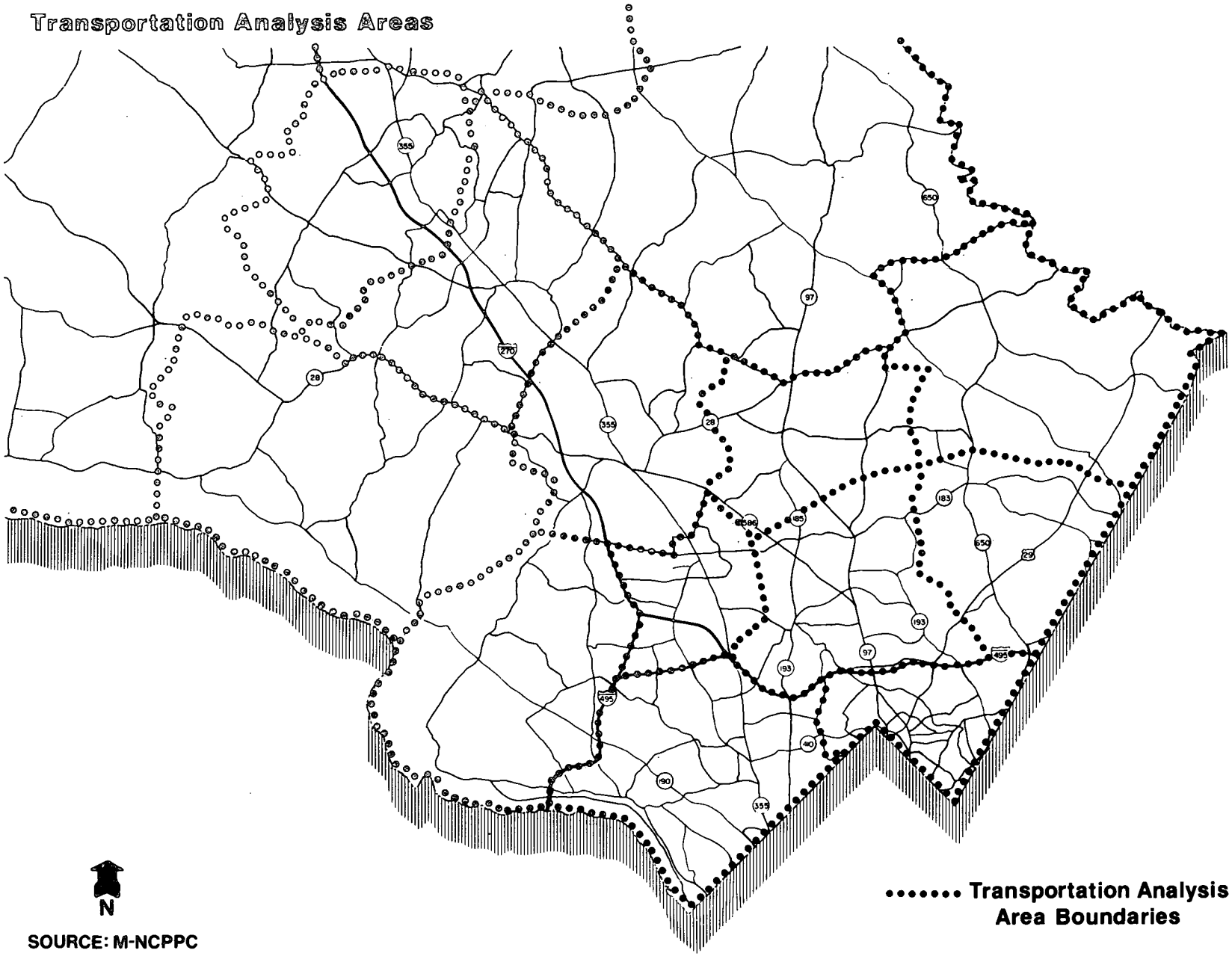

Transportation Analysis Areas
355
270
28
650
97
355
28
185
183
650
29
193
97
193
495
495
40
190
355
N
SOURCE: M-NCPPC
Transportation Analysis Area Boundaries

FIGURE 6.2

Impact of Traffic from Pipeline Development

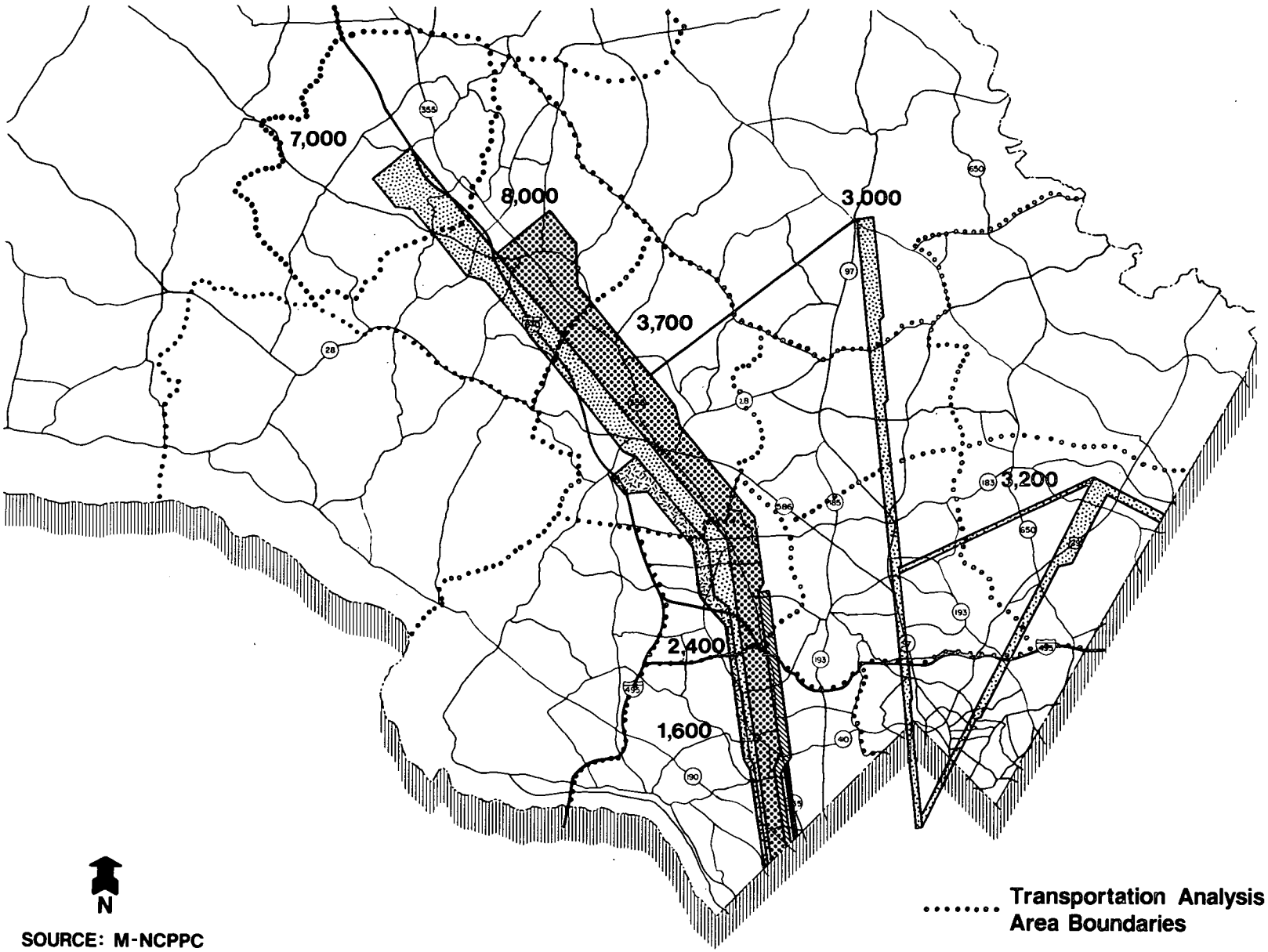


FIGURE 6.3

gram provides funds for the widening of Georgia Avenue to six lanes from Bel Pre Road through the intersection with Route 28. This improvement will relieve the peak-hour traffic congestion at the Georgia Avenue/Route 28 intersection and provide residual capacity to accommodate traffic from the pipeline in Olney. The capacity of the remaining two-lane portion of Georgia Avenue from Route 28 to Route 108 will be over-utilized by the combination of existing traffic plus traffic from the pipeline development. Therefore, Georgia Avenue should be widened from two to four lanes if this development is to be accommodated. Recapture through development lags or other means could delay this requirement. However, both existing zoning and the concept plan calls for levels of development which would ultimately require this improvement.

In the upper U.S. Route 29 Corridor, measurement of level of service by the PM peak-hour intersection capacity technique indicates a marginal condition. This condition is also shown by examination of average daily traffic volume to capacity ratios. However, field observations of the roadway north of White Oak show a better level of service. The most likely explanation for this difference between calculated and observed level of service is that U.S. Route 29 is a high design limited access facility with relatively minor volumes of traffic on cross roadways. The intersections are widely spaced with traffic actuated signals. It appears that the existing roadway can accommodate the incremental growth in traffic from the 3,200 dwelling units with sewer commitments. The big question mark in this corridor is the impact from growth of Columbia in Howard County.

RECOMMENDATIONS FOR COUNTY AND STATE HIGHWAY PROJECTS

Marginal and critical links have been identified. The impact of the amount and location of pipeline development has been addressed with respect to the trip distribution patterns generated by those units. The two analyses can now be combined and recommendations made on County and State highway projects. The recommendations are as follows:

State Primary Plan and Program

Continued emphasis must be placed on three very important projects. Improvement to I-495 from Georgia Avenue to Wisconsin Avenue is required to overcome existing capacity and safety problems. The Rockville Facility/Intercounty Connector is required to provide relief to existing critical level of service conditions in that east-west corridor. The third project is the widening of I-270 to eight lanes from Montrose Road to Montgomery Village Avenue with interchange improvements at Shady Grove Road, Route 28, Falls Road, and Montrose Road. Existing volumes are already creating marginal conditions and the concentration of pipeline dwelling units and forecasted employment in the I-270 Corridor will heighten the problem rapidly.

State Secondary Plan and Program

Category 1 projects are those improvements which are programmed for construction or minor construction or operational improvements of the special projects program. The need for the projects currently in Category 1 has been amply documented and they should proceed as soon as possible.

Category 2 projects are those programmed for right-of-way acquisition, final engineering design or project planning, but not for construction. Again, the need for the projects on Layhill Road, Route 28 (Bauer to Georgia), Viers Mill Road Bridge, Route 355 (Shady Grove to Brooks), and the Eastern Arterial is real. The key point to remember is that additional avenues of travel should be provided to serve the magnitude of growth anticipated in the I-270 Corridor. The eastern

section of Route 118 from Middlebrook to Route 355 should be emphasized.

Category 3 projects are other high-priority projects of the Twenty-Year Highway Needs Study identified by the draft 1977 Maryland Transportation Plan and are candidates for program scheduling after the current five-year program.

Category 4 includes the remaining projects identified in the critical portion of the Twenty-Year Highway Needs Study.

Project	Limits	Comments
U.S. Route 29	0.4 miles north of Fairland to Montgomery County line	This section of 29 should be Category 4 and the section from New Hamsphire to Briggs Chaney elevated to Category 3.
New Hampshire	Randolph to Spencerville	The lower portion of this project from Randolph to Bonifant should be emphasized. It ties into the Layhill Road project and the County project on Bonifant
Georgia Avenue	Norbeck to Route 108	Required as Olney moves toward an ultimate increase in dwelling units of approximately 5,000.
Route 108	Olney Mill to New Hampshire	The western portion of this road from Olney Mill to Dr. Bird Road should be emphasized.
Route 28	Muddy Branch to I-270	Needed to serve Medical Center and other employment concentrations expected in the Shady Grove Road area.
Quince Orchard Road	Route 28 to I-270	Section from County's western arterial to I-270 is of greater significance.
Route 355	Montgomery Village Avenue to Route 27	Needed primarily to serve staged development in Germantown east of I-270 including Montgomery College.
Falls Road	Falls Bridge Lane to I-270	Required to overcome existing problems. Additional capacity may be marginal.
The following projects should be added to Category 3 of The Maryland Transportation Plan and the Twenty-Year Highway Needs Study.		
River Road	Willard Avenue to Ridgefield Road	Improvements are required to overcome existing deficiencies.
U.S. Route 29 Spur	U.S. Route 29 south of New Hampshire Avenue to University Boulevard	Needed to relieve congestion at Colesville Road and University Boulevard, provide a "stormproof" crossing of the Northwest Branch, and serve growth in the Colesville/Fairland area.

County Capital Improvements Project

There are at least two projects which are not currently in the program for construction which are needed. The first is widening of Shady Grove Road to six (6) lanes from I-270 to Route 355. The improvement should be made in conjunction with interchange improvements at Shady Grove Road and I-270. The second projection would be the widening of Nicholson Lane and Twinbrook Parkway to provide relief to roadways near the Nicholson Lane and Twinbrook Metrorail Station. An additional lane is suggested on Nicholson Lane between Old Georgetown Road and Rockville Pike. Two additional lanes are recommended on Twinbrook Parkway between the B & O Railroad overpass and Ardennes Avenue.

GROWTH MANAGEMENT WITH TRANSPORTATION SYSTEM CAPACITY AS A CONSTRAINT ON DEVELOPMENT

The hypothesis of this section is that the impact of growth on highways can best be effectively measured at an aggregated scale, rather than on a subdivision-by-subdivision basis. The ability to measure the impact of a small unit of development is impaired because of several factors. First, the traffic generated by a small unit disperses through the system rapidly, and only nearby intersections can be analyzed with a high degree of certainty. Traffic cannot be traced downstream and, therefore, the cumulative impact on downstream, in this case down-county, intersections is lost. Second, the percentage increase in traffic at nearby intersections resulting from a small unit of development is low compared to total traffic. Thus, the incremental change in level of service frequently is small; and it is hard to justify denial of development on such a fine margin. Third, the normal variation in traffic volumes sometimes has a greater range than the incremental increase in traffic from a small unit of development.

The approach of analyzing the aggregate effect of development on the transportation system overcomes some of the problems of small unit analysis. The scale of analysis makes it possible to look at system-wide effects. The concept proposed for development by the Planning Board staff during 1978 is to divide the County into fifteen (15) transportation analysis areas. A limit on development within each area would be calculated, and development would be allowed to occur up to that limit on a first-come, first-served basis.

To carry out this concept, a transportation model is required. A model of this type has been specifically adapted for use in Montgomery County during the Corridor Cities Transportation Impact Study (CCTIS). The model used in the study is an extension of the existing Council of Governments' TRIMS model that is used for region-wide transportation modelling. For the CCTIS project, new transportation zones and a new transportation network were developed for Montgomery County. The zone and network structure are sufficiently fine grained to allow transportation analysis for subareas of the County. There are 250 zones for the County and the network contains freeways, majors, arterials, and selected collector roads. The 15 transportation analysis areas are composed of groupings of the zones.

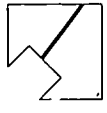
The model will be applied using base year land use inputs and the existing transportation network. The validity of the model will be checked to ensure that it replicates trip interchanges between geographic areas and that assigned traffic volumes correlate to actual ground counts. Next, the model will be loaded with alternative future development end-state conditions, including the "pipeline," the "pre-pipeline," the forecasts, and the holding capacity. The transportation network will include all State and County highway projects that are scheduled for construction in the current program. Metrorail lines to Shady Grove and Glenmont will be included in the analysis.

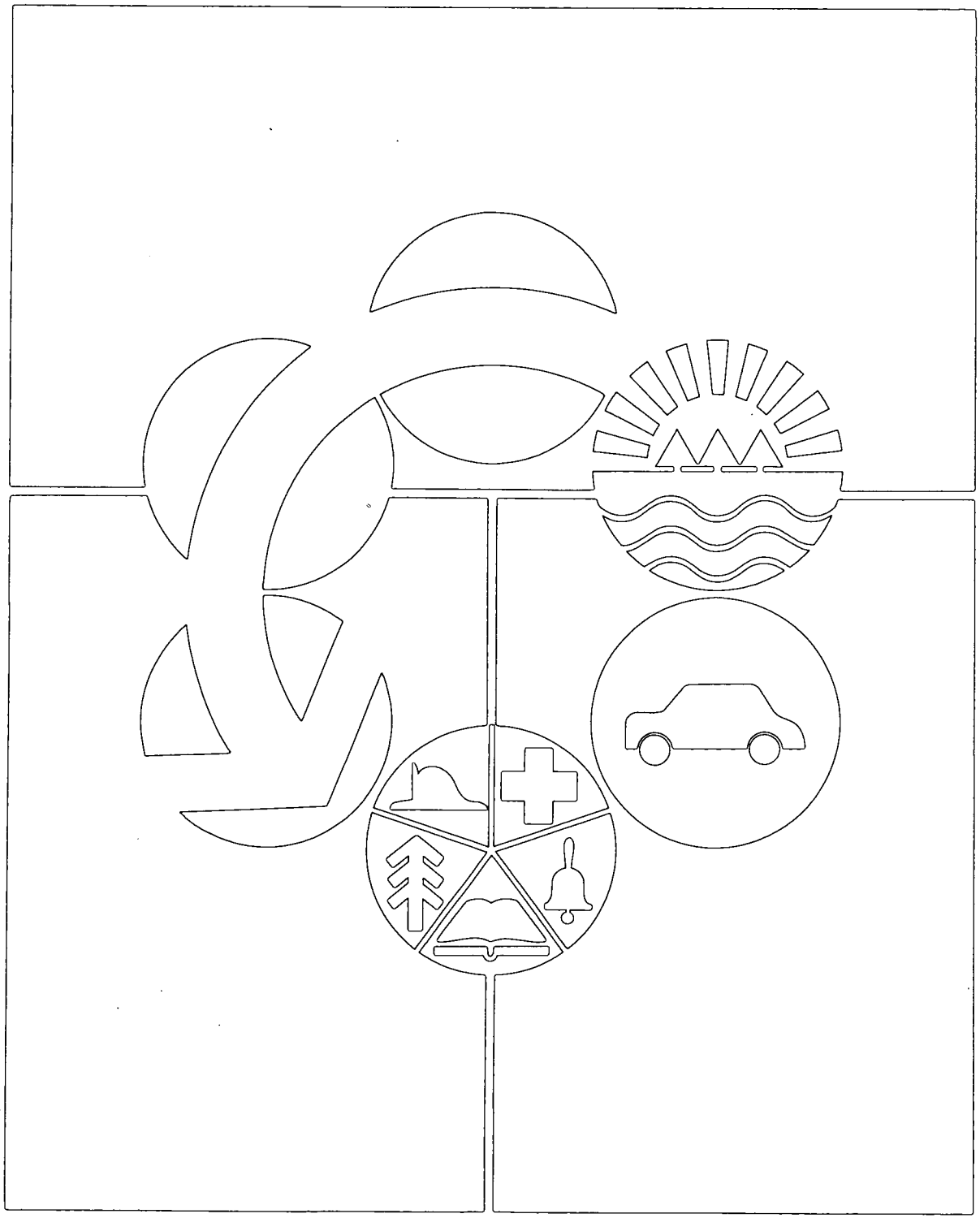
The base case results will then be compared to the results associated with additional growth. The comparison can be made in several ways. At this time the most useful comparison appears to be the percentage increase in assigned traffic on a link-by-link basis from the base case to the design year case. By looking at the percentage increase in assigned traffic, the roads most heavily impacted by development can be quickly identified.

If the roads which are heavily impacted by development currently operate under marginal or critical level of service conditions, then a problem is identified. Three courses of action are available. First, some type of transportation improvement could be implemented. This could include capital improvements to increase roadway or intersection capacity, transit service to more effectively utilize existing capacity, or transportation systems management (TSM) techniques. Second, the LOS could be allowed to fall below the threshold that is established by policy and be allowed to approach LOS E conditions, which is full utilization of ultimate roadway capacity. This approach would tend to spread peak traffic conditions over a longer period of time. Finally, development could be limited such that the increase in traffic on critical and marginal links falls within acceptable bounds. This, as suggested previously, could take the form of threshold capacities on development within transportation analysis areas which would be filled on a first-come, first-served basis.

In order to accomplish the last solution to the problem, the transportation model being used must be sophisticated enough to be able to do such things as trace the origins and destination of trips assigned to a

specific link, separate through trips from local trips, show the distribution of trips emanating from a geographic source area, and be able to graphically display the results. The CCTIS model has these capabilities. The concept is to model the situation and analyze the results in sufficient detail to make the two critical sets of recommendations that will come out of the process, i.e., first which transportation system projects are required to serve future development, and what staging, if any, should be employed to limit development until these projects are programmed for construction.





Chapter Seven

IMPACT of "PIPELINE" on SCHOOL FACILITIES

CHAPTER VII

IMPACT OF "PIPELINE" ON SCHOOLS

SUMMARY

This chapter assesses the relationship between the amount of new growth in the "pipeline" and the capacity of programmed school facilities, including an exploration of the use of the computerized demographic modelling system to forecast shifts among population age groups that would affect school enrollment. As a demonstration, the model is used to translate the total dwelling units in the "pipeline" into future population in the school age groups, representing the demand for school pupil space, which is then compared with an inventory of school buildings and space which constitutes the available supply of space and facilities. The study analyzes this demand/supply relationship for elementary, junior high, and senior high school levels, over the 1977-87 period, which is assumed to be roughly comparable with the build-out period of the "pipeline."

Elementary Schools - Up-County area schools are generally expected to have enrollment increases which will cause existing schools to operate at over 100 percent of capacity by 1987. Most down-County elementary schools will have decreased enrollments.

Junior High Schools - While little change is expected in the overall utilization ratios, some areas will experience substantial changes by 1987. For example, enrollment in the I-270 Corridor is expected to increase by almost 90 percent. In the areas below Rockville, major decreases are expected in the range of 20 to 30 percent.

Senior High Schools -County-wide school enrollment would decrease by over 2,300 students by 1987. The only areas of the County where senior high school enrollments are projected to increase, and result in enrollments which will exceed existing capacities, are in Gaithersburg, Germantown, Damascus, and Poolesville. Elsewhere, enrollments are projected to change only modestly, except in the Bethesda,, Potomac and North Bethesda areas, where the combined enrollment decline is expected to be almost 2,600 students.

IMPACT OF "PIPELINE" ON SCHOOLS

BACKGROUND

This analysis tests the impact of pipeline development on existing school capacities. Estimates are made for planning areas and groups of planning areas, assuming only the pipeline level of development for the 1977-1987 period. Age-specific population estimates are included for the age groups impacting the public school enrollment in the County, specifically the 0-5 age group which will enter the school system during the projection period, and the 5-10, 10-15, and 15-17 year age groups, some of which will progress through the system or leave the system during the projection period.

Population in the school age groups represents the demand for school pupil space and facilities over the projection period. The existing inventory of school buildings and space, for elementary and secondary school enrollments, as well as for new schools constructed 1977-1987, constitutes the available supply of space and facilities. This study attempts to analyze the demand/supply relationships that exist between school facilities and projected enrollment over the 1977-1987 period. The analysis is carried out for the smallest subareas possible, given the availability of adequate data. Changes in demands for available space in the school system throughout the County are reviewed and analyzed for the policy implications for changing school service areas and school facilities in response to continued enrollment shifts.

METHODOLOGY

The future school age population of the County, assuming a given level of new construction 1977-1987, and continued aging of existing population, plus in- and out-migration over the period, was estimated utilizing the Demographic Model. A summary description of the Demographic Model is included on page 22 of the Third Annual Growth Policy: People, Jobs, and Housing. Current capacity information on available school facilities was obtained from the Board of Education at the beginning of the 1977-1978 school year.

The 1974 Census Update Survey results were tabulated by eight subareas of the County, representing aggregations of the 26 planning areas. However, this information was not entered directly into the Demographic Model on a subarea basis, but instead County-wide averages of demographic change indicators were used to make planning area estimates. County-wide averages were used to calibrate the model because it was impossible to estimate separate sets of rates from the Census Update Survey for each planning area given the size of the sample and the cross-tabulations required. With availability of the 1977 Census Update Survey data, our base information source will be greatly improved due to the greater number of responses obtained and the ability to better understand trends because of three base points for comparison purposes, 1970, 1974 and 1977, rather than just one or two. When the data is available, an attempt will be made to calibrate the model on a subarea basis.

As should be expected, the model now predicts best for those planning areas which have demographic characteristics close to County-wide averages. For those planning areas that differ the most from County-wide averages, the model's predictive abilities decline accordingly. For example, in Potomac which had the largest average household size in 1974, the model tends

to underestimate the population by using average rates for in-migration. The population for Silver Spring is slightly overestimated since the model uses only one set of rates for multi-family in-migration. This is because Silver Spring has more high-rise units than the County-wide multi-family dwelling unit mix and, therefore, the model moves too many persons into Silver Spring's multi-family units. The qualifications of using the Demographic Model on a subarea basis are discussed in more detail later in this report.

School Enrollments and Capacities by Planning Area

Enrollment information for all schools in the County is collected twice yearly through a school census in June and September for each school in the system. The most recent information available at the time of the study, June 1977, was utilized. This was tabulated for elementary, junior high, and senior high school levels by planning areas and County-wide.

Capacity information is compiled by the Board of Education on individual schools in the system and stated as a range representing students per school. In general, the planned capacity of an elementary school is about 600 students, for a junior high school about 1,000, and for a high school about 1,200. However, individual schools are built larger or smaller; and capacity varies by the number of alterations made to the school over time. Capacity is generally computed based on the number of classrooms or teaching stations in the school. With declining enrollment and less need to construct classrooms, the provision of auxiliary space for school program requirements has reduced the capacity of many schools.

A typical capacity calculation for an elementary school with a Head Start program would be as follows:

1 Head Start Room @ 15-30 children/room	=	15- 30
2 Kindergarten Rooms @ 40-50 students/room	=	80-100
16 Grades 1-6 Classrooms @ 25-30 students/room	=	400-480
2 Special Education Rooms @ 10 students/room	=	20- 20
21		515-630

Secondary school capacities are calculated by applying 25 students per teaching station. Support spaces, i.e., media centers, seminar rooms, are not counted as teaching stations. Special education stations are calculated at 15 students per station.

State capacity calculations for elementary schools are based on 30 students/room. Both the high and low capacity figures published by the Board of Education are tested in the analysis. In many cases the school capacity figures deduct one or more classrooms per school for auxiliary instructional program use. For this reason and also to be more consistent with State standards, the lower range of capacity figures used by the Board of Education are probably conservative.

Qualifications to Demographic Model Results

As mentioned previously, the calibration of the Demographic Model has been completed primarily on the County-wide basis. Thus, there are certain sensitivities in demographic changes by subarea of the County which are not captured by the model. Primarily, these changes relate to assumed turnover rates in the housing supply, i.e., that portion of the population expected to move in or out over the projection period; and, secondly, the characteristics of in- and out-migrants for local areas within the County. These sensitivities are discussed in greater detail below and should be kept in mind when analyzing the Demographic Model

projections of school age population for planning areas in this study. To the extent that local areas differ from the County-wide averages used by the model, some differences will occur in the local projections of age groups for those areas.

Turnover Rates Assumed for Local Areas

The degree of turnover assumed to occur in a local area is important for projecting long-range change in the age profile of the population because it indicates that portion of the total population moving into the area not now living there, and thus for which new age characteristics must be assumed. The people now living in the area and assumed to remain there are merely aged over the 10-year or other time frame of the projection period. For example, if a turnover in the existing housing stock over 10 years is assumed to be 40 percent, and new construction by 1982 is expected to be equal to 15 percent of the existing 1977 housing stock, then 55 percent of the 1987 residents in the area would not have lived there in 1977.

The Demographic Model, as now operative, uses County-wide turnover rates by age of head of household obtained from the 1974 Census Update Survey for the 5-year period from the April 1970 Census to April 1974. These rates are 50 percent for multi-family, 34 percent for single-family, for an overall average of 39 percent. These rates were used for all planning areas, even though turnover rates tend to vary by local areas. More recent data tend to indicate a number of changes in the rates not reflected in the model. The first is that turnover in both rental and owner-occupied dwellings is declining throughout the County. This is in response to a slowing of in-migration with less new construction and current residents tending to remain where they are.

The following tables attempt to illustrate these County-wide trends as well as document some of the differences in turnover rates that exist among subareas of the County. (In this case, election districts were used rather than planning areas because of the availability of data.) As shown in Table 7.1, total turnover due to housing sales (transactions) for the 4-year period January 1973 through January 1977 was only 27.1 percent of the total inventory estimated as of the end of 1977. This compares to 34 percent for the comparable period April 1970-April 1974. Differences among planning areas are substantial, depending on the mobility of the population and amount of new housing construction. Poolesville, Darnestown, Gaithersburg, Olney, and Potomac all had sales turnover rates well above the County average. Wheaton, Silver Spring, Bethesda, and Colesville were well below the County-wide average. Substantial differences between what is in the Demographic Model for each subarea for owner turnover rates versus the current actual experience were found, particularly for Poolesville, Potomac, Wheaton, and Colesville.

Table 7.2 indicates similar data for rental turnover based on a one-year rental vacancy survey, the data from which was projected to represent a comparable 5-year time span. Total rental turnover for the 1973-77 period is estimated to be only about 33 percent. Certain election districts had rates well above the County-wide average: Colesville, Gaithersburg, and Darnestown. In terms of the rate of 50 percent which is included in the Demographic Model, more recent data shows rental turnover rates well below this figure for Wheaton, Silver Spring, Potomac, and Olney.

Components of Change in School Age Population for Local Areas

Tables 7.3 to 7.6 on Components of Change in School Age Population: 1977-1987 provide material by which to

TABLE 7.1

DWELLING UNIT TURNOVER RATES
BASED ON SALES TRANSACTIONS OF NEW AND USED UNITS
JANUARY 1973 - DECEMBER 1977
BY ELECTION DISTRICTS

Election District	Total Transactions 1973-1977[1]	Dwelling Unit Inventory 12/31/77[2]	Transaction Percent of Total Inventory	Demographic Model Estimates for County Average of 34% (Percent = (+) Above; or (-) Below)
Laytonsville	194	1,353	14.3	(-) 19.7
Clarksburg	460	1,536	28.1	(-) 5.9
Poolesville	1,055	1,416	74.5	(+) 40.5
Rockville	8,536	28,513	29.9	(-) 4.1
Colesville	3,035	17,305	17.5	(-) 16.5
Darnestown	1,383	3,008	45.9	(+) 11.9
Bethesda	7,498	34,956	21.4	(-) 12.6
Olney	2,674	6,948	38.5	(+) 4.5
Gaithersburg	9,616	20,740	46.4	(+) 12.4
Potomac	3,576	7,322	48.8	(+) 14.8
Barnesville	53	746	7.1	(-) 26.9
Damascus	682	2,410	28.3	(-) 5.7
Wheaton	15,689	74,550	21.0	(-) 13.0
TOTALS	54,451	200,803	27.1	(-) 6.9

[1] 1977 Transaction data estimated from previous housing market trends.

[2] Dwelling unit inventory projected from Demographic Model, January 1977, with the addition of housing completions current and proposed for full Year 1977.

TABLE 7.2

RENTAL UNIT TURNOVER RATES
BASED ON TRANSACTIONS FOR YEARS 1973-1977[1]
AGGREGATED TO ELECTION DISTRICTS

Election District	Est. Total Rental Units Reoccupied 1973-77	Dwelling Unit Inventory 12/31/77[2]	Percent of Total Rental Turnover	Diff. in Demographic Model Estimates for County Average of 50% (Percent = (+) Above; or (-) Below)
Laytonsville	-	1,353	-	
Clarksburg	-	1,536	-	-
Poolesville	-	1,416	-	-
Rockville	6,924	28,513	24.2	(-) 25.8
Colesville	13,626	17,305	78.7	(+) 28.7
Darnestown	2,475	3,008	82.2	(+) 32.2
Bethesda	8,425	34,956	24.1	(-) 25.9
Olney	60	6,948	.86	(-) 49.14
Gaithersburg	15,125	20,740	73.0	(+) 23.0
Potomac	240	7,322	3.3	(-) 46.7
Barnesville	-	746	-	-
Damascus	20	2,410	.83	(-) 49.17
Wheaton	18,850	74,550	25.3	(-) 24.7
TOTALS	65,745	200,803	32.7	(-) 17.3

[1] Average annual turnover rates by Rental Units based on 1977 C.O.G. Rental Survey, supplied by Housing Opportunities Commission, Montgomery County.

[2] Dwelling unit inventory projected from Demographic Model, January 1977, with the addition of housing completions, current and proposed, for full Year 1977.

TABLE 7.3

SUMMARY: COMPONENTS OF CHANGE IN SCHOOL AGE POPULATION, 1977-1987

	Demographic Model Population[a]			Components of Change--	
	Est. 1977 (1)	Proj. 1987 (2)	Change (3)	From Aging 1977 Pop. to 1987[1] (4)	From Construction and Migration[2] (5)
Elementary	66,678	67,241	+ 563	-17,533	+18,096
Junior High	32,165	29,899	-2,266	- 6,153	+ 3,887
High School	31,580	28,938	-2,642	- 4,556	+ 1,914
Total	130,423	126,078	-4,345	-28,242	+23,897

[a] Derived from Demographic Model.

[1] Change in school age population anticipated in 1987 without inmigration or outmigration. Includes births and deaths, 1977-1987.

[2] Change in school age population anticipated in 1987 due to additional units and migration between 1977-1987. Calculated by subtracting Col. (4) from Col. (3).

evaluate and review the 1987 population projected by the Demographic Model. It provides a "peek" into the "black" box of the model to quantify separately two critical elements, namely, change due to aging of the population and change due to migration.

Changes in population result from the interaction of three components, as follows:

$$P_{87} = P_{77} + (\text{Births}_{77\text{-}87} - \text{Deaths}_{77\text{-}87}) + \text{Net Migration}$$

The 1977 population estimate is based on the 1974 Census Update Survey adjusted to include natural increase (B-D) and net migration. Net migration is determined by first estimating non-movers (household heads). The excess of housing stock (arising from new construction and vacancies due to movers) is filled by in-migrants. Factors to determine out- and in-migration, by housing type, are based on the results of the 1974 Census Update Survey.

To approximate the effect of natural aging, the assumption is made that the existing population remains "in place" over the 10-year period 1977-1987 (households will remain in their 1977 place of residence) but will experience births and deaths. The built-in flexibility of the model makes it possible to develop estimates of this hypothetical situation. The "aging" of the population would result in a decline of over 28,200 students County-wide, with elementary grades accounting for 62 percent of the decline. Since an overall decline of 4,345 was projected in the model, a gain of 23,900 students may be attributed to in-migration (77 percent are in elementary schools). This methodology yields the maximum impact of "aging" and, therefore, understates the migration effect.

Components of change are shown for elementary, junior high, and senior high school, by area. It should be noted that data presented by subarea have the following limitations:

- The model is calibrated to utilize County-wide average values. Therefore, those planning areas with average value higher than the County are typically understated and, conversely, those areas with below-County averages are typically overstated. Overestimates may, therefore, be expected in such areas as Bethesda, Silver Spring, Takoma Park, etc., and areas underestimated include Potomac, Gaithersburg, White Oak, etc.

- The geographic boundaries of planning areas frequently do not coincide with school boundaries. School service areas, particularly of junior high and senior high schools, required staff judgments to allocate school population to appropriate planning areas.

- Factors used in the 1974 Census Update Survey, particularly average household size, age of population and movers, may no longer

TABLE 7.4

COMPONENTS OF CHANGE IN ELEMENTARY SCHOOL POPULATION, BY AREA: 1977-1987

Forecast Area and Planning Area	Demographic Model Population[a] Est. 1977 (1)	Proj. 1987 (2)	Change (3)	Components of Change-- From Aging 1977 Pop. to 1987[1] (4)	From New Construction and Migration[2] (5)
URBAN RING					
PA 26 Rockville	6,113	5,115	- 998	- 1,954	+ 956
27 Aspen Hill	6,118	5,129	- 989	- 2,235	+ 1,246
30 N. Bethesda	2,976	3,111	+ 135	- 687	+ 822
31 Wheaton	9,182	6,299	-2,883	- 2,846	- 37
32 Kemp Mill	3,718	2,636	-1,082	- 1,214	+ 132
35 Bethesda	8,066	8,336	+ 270	- 1,353	+ 1,623
36 Silver Spring	2,665	3,311	+ 646	+ 10	+ 636
37 Takoma Park	2,520	2,531	+ 11	+ 139	- 128
I-270 CORRIDOR					
PA 13 Clarksburg	283	168	- 115	- 132	+ 17
19 Germantown	846	3,770	+2,924	- 231	+ 3,155
20&21 Gaithersburg	6,866	9,691	+2,825	- 429	+ 3,254
COLESVILLE					
PA 28 Cloverly	1,133	900	- 233	- 331	+ 98
33 White Oak	3,034	2,267	- 767	- 1,079	+ 312
34 Fairland	1,043	1,454	+ 411	- 398	+ 809
POTOMAC					
PA 25 Travilah	886	917	+ 31	- 298	+ 329
29 Potomac	4,949	3,669	-1,280	- 2,407	+ 1,127
OLNEY					
PA 22 Rock Creek	609	679	+ 70	- 220	+ 290
23 Olney	2,589	3,356	+ 767	- 763	+ 1,530
DAMASCUS	1,845	2,313	+ 468	- 701	+ 1,169
PA 10 Bennett					
11 Damascus					
14 Goshen					
15 Patuxent					
POOLESVILLE	1,237	1,589	+ 352	- 404	+ 756
PA 12 Dickerson					
16 Martinsburg					
17 Poolesville					
18 Lower Seneca					
24 Darnestown					
TOTAL COUNTY	66,678	67,241	+ 563	-17,533	+18,096

[a] Derived from Demographic Model

[1] Change in elementary school age population anticipated in 1987 without inmigration or outmigration. Includes births and deaths, 1977-1987.

[2] Change in elementary school age population anticipated in 1987 due to additional units and migration between 1977-1987. Calculated by subtracting Col. (4) from Col. (3).

TABLE 7.5

COMPONENTS OF CHANGE IN JUNIOR HIGH SCHOOL POPULATION, BY AREA: 1977-1987

Forecast Area and Planning Area	Demographic Model Population[a] Est. 1977 (1)	Proj. 1987 (2)	Change (3)	Components of Change-- From Aging 1977 Pop. to 1987[1] (4)	From New Construction and Migration[2] (5)
URBAN RING					
PA 25,26 Rockvl.& Trav.	3,373	2,795	- 578	- 615	+ 37
27 Aspen Hill	3,069	2,307	- 762	- 886	+ 124
30 Bethesda	1,560	1,336	- 224	- 414	+ 190
31 Wheaton & SS(pt.)	5,217	3,826	-1,391	- 1,110	- 281
32 Kemp Mill	1,916	1,240	- 676	- 578	- 98
35 Bethesda & SS(pt.)	4,217	3,769	- 448	- 1,030	+ 582
36,37 Silv.Spring(pt.) & Takoma Park	1,301	1,554	+ 253	+ 350	- 97
I-270 CORRIDOR					
PA 19,20,21 Germantwn, Gaithersburg, Goshen, Woodfld.(pt.)&Darnstwn)	3,026	5,697	+2,671	+ 998	+ 1,673
COLESVILLE					
PA 33 White Oak	1,781	1,157	- 624	- 743	+ 119
34 Fairland	749	762	+ 13	- 252	+ 265
POTOMAC					
PA 29 Potomac	2,763	1,690	-1,073	- 1,318	+ 245
OLNEY					
PA 22 Rock Creek, 23 Olney	1,557	1,919	+ 362	- 144	+ 506
DAMASCUS					
PA 11,13 Damascus & Clarksburg)	1,059	1,119	+ 60	- 329	+ 389
POOLESVILLE	577	728	+ 151	- 82	+ 233
PA 12 Dickerson					
16 Martinsburg					
17 Poolesville					
18 Lower Seneca					
24 Darnestown					
TOTAL COUNTY	32,165	29,899	-2,266	- 6,153	+ 3,887

[a] Derived from Demographic Model.

[1] Change in Junior High School age population anticipated in 1987 without inmigration or outmigration. Includes births and deaths, 1977-1987.

[2] Change in Junior High School age population anticipated in 1987 due to additional dwelling units and migration between 1977-1987. Calculated by subtracting Col. (4) from Col. (3).

[3] Where planning area and school boundaries do not coincide, staff judgment was used to fit service area boundaries into planning areas.

TABLE 7.6

COMPONENTS OF CHANGE IN HIGH SCHOOL POPULATION, BY AREA: 1977-1987

Forecast Area and Planning Area	Demographic Model Population[a] Est. 1977 (1)	Proj. 1987 (2)	Change (3)	Components of Change-- From Aging 1977 Pop. to 1987[1] (4)	From New Construction and Migration[2] (5)
URBAN RING					
PA 25,26 Rockvl.&Trav.	3,201	2,758	- 443	- 363	- 80
27 Aspen Hill (pt.)	1,956	1,649	- 307	- 253	- 54
30 Bethesda	1,745	1,278	- 467	- 588	+ 121
31 Wheaton	4,647	3,134	-1,513	- 994	- 519
32 Kemp Mill	1,867	1,285	- 582	- 409	- 173
35 Bethesda	4,574	3,489	-1,085	-1,394	+ 309
36,37 Silv.Spring(pt.) & Takoma Park	2,160	2,380	+ 220	+ 133	+ 87
I-270 CORRIDOR					
PA 19,20,21 Germantwn., Gaithersburg,Goshen, Woodfld.(pt.)&Darnstwn)	2,621	5,276	+2,655	+1,022	+1,633
COLESVILLE					
PA 28 Cloverly	1,373	1,534	+ 161	- 62	+ 223
33 White Oak	1,853	1,095	- 758	- 656	- 102
34 Fairland	520	568	+ 48	- 101	+ 149
POTOMAC					
PA 29 Potomac	2,437	1,778	- 659	- 581	- 78
OLNEY					
PA 22 Rock Creek & Aspen Hill (pt.)	1,103	1,002	- 101	- 124	+ 23
DAMASCUS					
PA 11 Damascus & Clarksburg (pt.)	984	1,044	+ 60	- 157	+ 217
POOLESVILLE	539	668	+ 129	- 29	+ 158
PA 12 Dickerson					
16 Martinsburg					
17 Poolesville					
18 Lower Seneca					
24 Darnestown					
TOTAL COUNTY	31,580	28,938	-2,642	-4,556	+1,914

[a] Derived from Demographic Model.

[1] Change in High School age population anticipated in 1987 without inmigration or outmigration. Includes births and deaths, 1977-1987.

[2] Change in High School age population anticipated in 1987 due to additional units and migration between 1977-1987. Calculated by subtracting Col. (4) from Col. (3).

[3] Where planning areas and school boundaries do not coincide, staff judgment was used to fit service area boundaries into planning areas.

be appropriate in 1977 and their extrapolation 10 years into the future obviously has a range of uncertainty to it that must not be forgotten. These factors will need to be compared with the results of the forthcoming 1977 Census Update, and further interpretations made at that time.

SCHOOL IMPACT ASSESSMENT CONCLUSION

Conclusions can be made on the adequacy of school space in relation to pipeline development by comparing enrollment to planned school capacities throughout the County for the projection period, 1977-1987. Total school enrollment for the base period, 1977, was obtained from the Board of Education's June 1977 student census. However, to obtain the 1987 projected school enrollment, a relationship had to be established between total school age population and public school enrollment, since not all the school age population attend public schools. It was determined, based on available data, that the existing 1977 ratio between total school age population and public school enrollment, by planning area, was the best possible figure to apply the total 1987 school age population to obtain public school enrollments. Public school enrollment has generally remained stable, at about 86 percent of total school enrollment, since 1970, according to figures published by the State of Maryland.

After 1987 public school enrollments were projected by planning areas, they were analyzed against currently available school capacities for appropriate service areas for elementary, junior high and senior high school levels. This analysis is summarized in a series of tables and maps and is explained in the following sections of the report.

Elementary School Enrollment Trends

Total enrollment for elementary schools by each planning area is shown in Table 7.7 and Table 7.8, column one. School capacities are also tabulated by planning area and compared with spring 1977 enrollments to determine an existing enrollment/capacity ratio for each area, expressed as a percent in the third column of the table. Enrollments are then projected to 1987 utilizing the ratio of 1977 enrollment to school age

population and applying this ratio to 1987 school age population. Enrollment changes 1977-1987 are then analyzed along with the resulting 1987 enrollment/capacity ratios based on available 1977 capacity for both high and low figures.

Figure 7.1 summarizes elementary school enrollment/capacity trends by planning areas, 1977-1987 for the high capacity calculation. Overall the County-wide elementary school enrollment is expected to increase slightly, by 2,175 students. Elementary schools in the up-County area (above Rockville and including Olney) are generally expected to have enrollment increases causing the number of students in existing schools to exceed the school capacity by 1987. Areas shown on the map in shaded patterns are expected to have substantial enrollment declines resulting in a significant decrease in enrollment/capacity ratios. A number of elementary schools in the down-County area are projected to have slight increases in enrollments over the reduced enrollments of 1977, due to the assumption by the Demographic Model of some in-migration to these areas of school age children.

Similar results are shown for the lower capacity figures for elementary schools on Figure 7.2. Because the computed capacities by subarea are lower, the enrollment/capacity ratio for the County in 1977 was 93 percent rather than 73 percent, as was the case using the higher capacity figures. Generally, the enrollment changes, 1977-1987, show that the same areas will have fewer students by 1987. Fairland and Upper Rock Creek are expected to be operating at overcapacity by 1987 if the lower capacity figures are used, but not if the higher figures are used. Also areas above Rockville with faster growing populations have very tight capacity ratios if the lower capacity range is used.

TABLE 7.7

PROJECTION OF ELEMENTARY SCHOOL ENROLLMENT, BY PLANNING AREA: JAN. 1977-JAN. 1987

Forecast Area and Planning Area	Spring 1977 Actual[1] Enrollment	School Capacity	Capacity Percent	Projection[2] Jan. School Population 1977	Jan. School Population 1987	Enrollment Jan. 1987	Enrollment Change 1977-1987	1987 Capacity Percent
URBAN RING	31,901	43,170	74%	41,358	36,468	27,757	-4,144	64%
PA 26 Rockville	5,602	7,400	75	6,113	5,115	4,688	- 914	63
27 Aspen Hill	4,895	7,430	66	6,118	5,129	4,104	- 791	55
30 No. Bethesda	2,325	3,640	64	2,976	3,111	2,430	+ 105	67
31 Wheaton	7,480	10,705	70	9,182	6,299	5,131	-2,349	48
32 Kemp Mill	2,493	3,345	75	3,718	2,636	1,768	- 725	53
35 Bethesda	5,647	7,365	76	8,066	8,336	5,836	+ 189	79
36 Silver Spring	1,368	1,540	89	2,665	3,311	1,700	+ 332	110
37 Takoma Park	2,091	2,745	76	2,520	2,531	2,100	+ 9	77
I-270 CORRIDOR	8,187	9,620	85%	7,995	13,629	14,490	+6,303	151%
PA 13 Clarksburg	287	430	67	283	168	170	- 117	40
19 Germantown	1,041	1,240	84	846	3,770	4,639	+3,598	374
20621 Gaithersburg	6,859	7,950	86	6,866	9,691	9,681	+2,822	122
COLESVILLE	5,022	6,170	81%	5,210	4,621	4,457	- 565	72%
PA 28 Cloverly	1,326	1,620	82	1,133	900	1,054	- 272	65
33 White Oak	2,704	3,140	86	3,034	2,267	2,020	- 684	64
34 Fairland	992	1,410	70	1,043	1,454	1,383	+ 391	98
POTOMAC	5,341	7,220	74%	5,835	4,586	4,166	-1,175	58%
PA 25 Travilah	703	1,080	65	886	917	728	+ 25	67
29 Potomac	4,638	6,140	76	4,949	3,669	3,438	-1,200	56
OLNEY	2,726	3,160	86%	3,198	4,035	3,434	+ 708	109%
PA 22 Rock Creek	548	640	86	609	679	611	+ 63	95
23 Olney	2,178	2,520	86	2,589	3,356	2,823	+ 645	112
DAMASCUS	2,488	2,810	89%	1,845	2,313	3,119	+ 631	111%
PA 10 Bennett	-- Service Area --				na			
11 Damascus	1,071	1,170	92		na			
14 Goshen	1,111	1,080	103		na			
15 Patuxent	306	560	55		na			
POOLESVILLE	1,467	1,710	86%	1,237	1,589	1,884	+ 417	110%
PA 12 Dickerson	281	290	97		na			
16 Martinsburg	-- Service Area --				na			
17 Poolesville	695	800	87		na			
18 Lower Seneca	147	230	64		na			
24 Darnestown	344	390	88		na			
TOTAL COUNTY	57,132	73,860	77%	66,678	67,241	59,307	+2,175	80%

1/ Source: Montgomery County School Board
2/ Source: Demographic Model with housing inputs based on pipeline development

Junior High School Enrollment Trends, 1977-1987 - In the case of junior high schools (Grades 7-9), similar enrollment/capacity ratios were computed as for elementary schools. In the case of junior high school service area boundaries, which are larger than those of elementary schools, combinations of planning areas had to be used where boundaries overlapped the planning area boundary; in some cases assumptions had to be made splitting enrollment projections made by planning areas into appropriate school boundaries encompassing adjacent areas. Planning areas in the I-270 area were grouped into a single area, including Germantown and Gaithersburg, to correspond to current service area boundaries of the junior high schools in that area. Summary data by these designated areas are shown in Table 7.9.

TABLE 7.8

PROJECTION OF ELEMENTARY SCHOOL ENROLLMENT, BY PLANNING AREA, USING THE LOW RANGE OF CAPACITY

JAN. 1977-JAN. 1987

Forecast Area and Planning Area	Spring 1977 Actual[1] Enrollment	School Capacity	Capacity (Percent)	Projection[2] Jan. School Population 1977	Jan. School Population 1987	Enrollment Jan. 1987	Enrollment Change 1977-1987	1987 Capacity (Percent)
URBAN RING	31,901	35,995	89%	41,358	36,468	27,757	-4,144	77%
PA 26 Rockville	5,602	5,980	93	6,113	5,115	4,688	- 914	78
27 Aspen Hill	4,895	6,185	79	6,118	5,129	4,104	- 791	66
30 No. Bethesda	2,325	3,030	77	2,976	3,111	2,430	+ 105	80
31 Wheaton	7,480	8,230	91	9,182	6,299	5,131	-2,349	62
32 Kemp Mill	2,493	2,760	90	3,718	2,636	1,768	- 725	64
35 Bethesda	5,647	6,135	92	8,066	8,336	5,836	+ 189	95
36 Silver Spring	1,368	1,565	87	2,665	3,311	1,700	+ 332	108
37 Takoma Park	2,091	2,110	99	2,520	2,531	2,100	+ 9	99
I-270 CORRIDOR	8,187	7,955	103%	7,995	13,629	14,490	+6,303	182%
PA 13 Clarksburg	287	340	84	283	168	170	- 117	50
19 Germantown	1,041	1,010	103	846	3,770	639	+3,598	459
20421 Gaithersburg	6,859	6,605	104	6,866	9,691	9,681	+2,822	146
COLESVILLE	5,022	5,221	96%	5,210	4,621	4,457	- 565	85%
PA 28 Cloverly	1,326	1,340	99	1,133	900	1,054	- 272	78
33 White Oak	2,704	2,711	99	3,034	2,267	2,020	- 684	74
34 Fairland	992	1,170	85	1,043	1,454	1,383	+ 391	118
POTOMAC	5,341	5,995	89%	5,835	4,586	4,166	-1,175	69%
PA 25 Travilah	703	890	79%	886	917	728	+ 25	81
29 Potomac	4,638	5,105	91	4,949	3,669	3,438	-1,200	67
OLNEY	2,726	2,600	105%	3,198	4,035	3,434	+ 708	132%
PA 22 Rock Creek	548	555	98	609	679	611	+ 63	110
23 Olney	2,178	2,045	106	2,589	3,356	2,823	+ 645	138
DAMASCUS	2,488	2,315	107%	1,845	2,313	3,119	+ 631	135%
PA 10 Bennett	-	-	-	-	-	-	-	-
11 Damascus	1,071	960	111	-	-	-	-	-
14 Goshen	1,111	900	123	-	-	-	-	-
15 Patuxent	306	455	67	-	-	-	-	-
POOLESVILLE	1,467	1,400	105%	1,237	1,589	1,884	+ 417	134%
PA 12 Dickerson	281	230	122	-	-	-	-	-
16 Martinsburg	-	-	-	-	-	-	-	-
17 Poolesville	695	655	106	-	-	-	-	-
18 Lower Seneca	147	180	81	-	-	-	-	-
24 Barnestown	344	325	106	-	-	-	-	-
TOTAL COUNTY	57,132	61,481	93%	66,678	67,241	59,307	+2,175	96%

[1]/Source: Montgomery County School Board
[2]/Source: Demographic Model with housing inputs based on pipeline development

Figure 7.3 summarizes the enrollment/capacity changes expected to take place over the projection period. In 1977 total junior high school enrollment was 27,768 and total junior high school computed capacity was 33,413, or an enrollment/capacity ratio of 83 percent. This was above the elementary enrollment/capacity figure of 77 percent. With the construction activity assumptions tested in this analysis 1977-87, total junior high school enrollment is expected to decline only modestly, by 1,374 or 5 percent. This will result in a change in the enrollment/capacity ratio of only 6 percent, or from 83 percent in 1977 to 77 percent in 1987.

While there is little change in the utilization ratio for junior high schools overall, there are substantial changes in many parts of the County. As shown by the map, the area north of Rockville and including Olney shows substantial enrollment increases that, if realized, will have these schools operating at over 100 percent of capacity by 1987. The I-270 Corridor area is expected to increase enrollment by 88 percent, which will result in an enrollment/capacity ratio of 182 percent by 1987. In the entire up-County area there is an increase of 3,000 students.

In the area below Rockville, major decreases in enrollments for Grades 7-9 are projected. In many areas a decrease in utilized capacity of 20 to 30 percent occurs, resulting in severe undercapacity in certain areas such as Wheaton, Kemp Mill, Colesville, and Potomac.

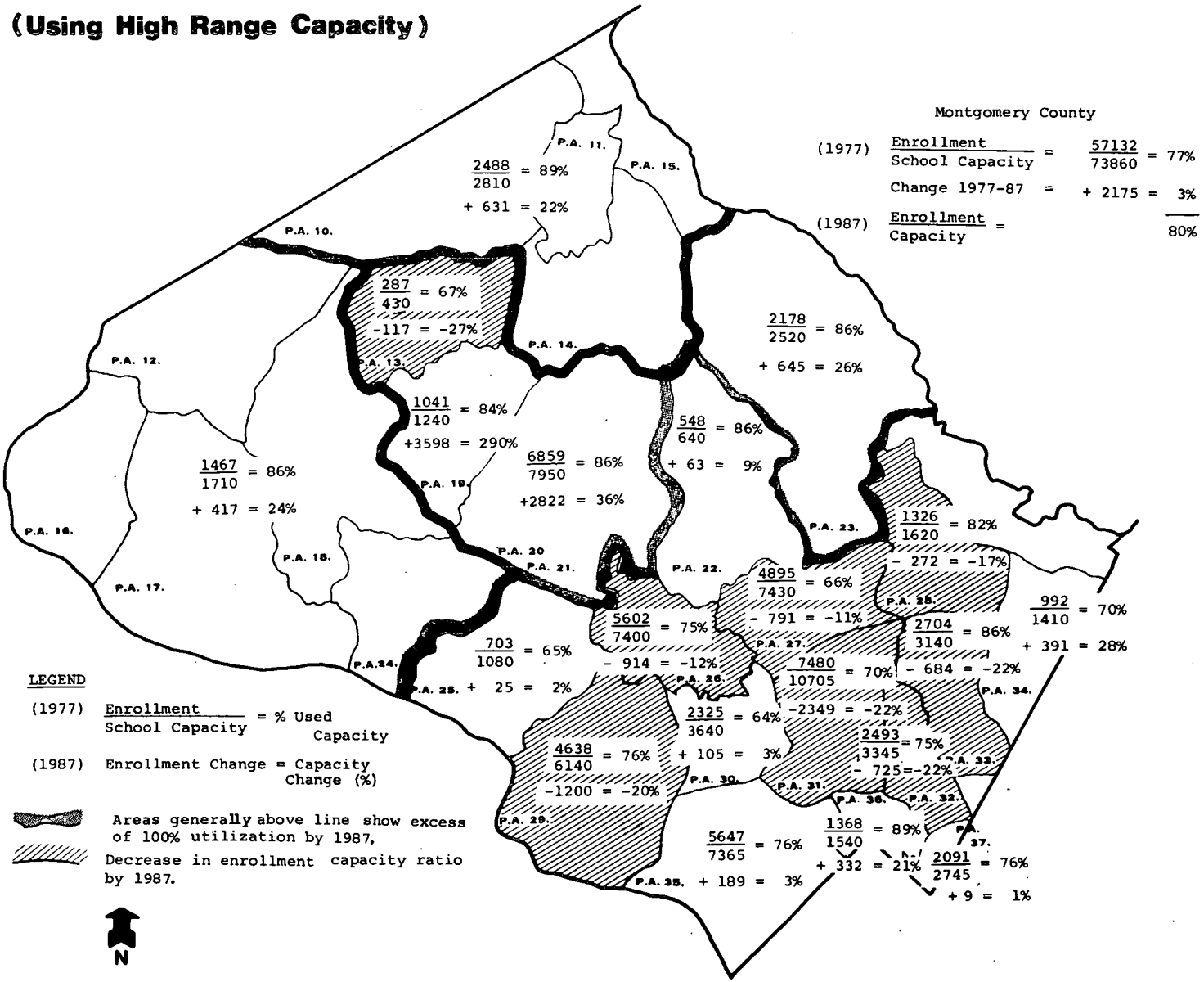
Senior High School Enrollment Trends, 1977-1987

Analysis of consolidated planning areas to correspond to current high school service area boundaries has been accomplished. The results of this analysis are shown in Table 7.10 for planning areas and groups of planning areas. Figure 7.4 shows the results of changes in projected high school enrollments, 1977-1987, and their impact on changes in enrollment/capacity ratios. County-wide high school enrollment is projected to decrease by 2,357 students, reducing the existing enrollment/capacity ratio by 6 percent, from 86 percent to 80 percent by 1987. The only areas of the County where high school enrollments are projected to increase and result in the need for more school capacity are in Gaithersburg, Germantown, Damascus, and Poolesville. Total projected increase in these areas is about 2,700 students.

Elsewhere in the County, enrollments are projected to decline or increase only modestly. Enrollment declines projected for Bethesda, Potomac, and North Bethesda area include almost 2,600 students. Enrollment declines in Rockville, -650; in Aspen Hill, -264, and in Upper

Elementary School Enrollment Trends, Jan. 1977-1987

(Using High Range Capacity)

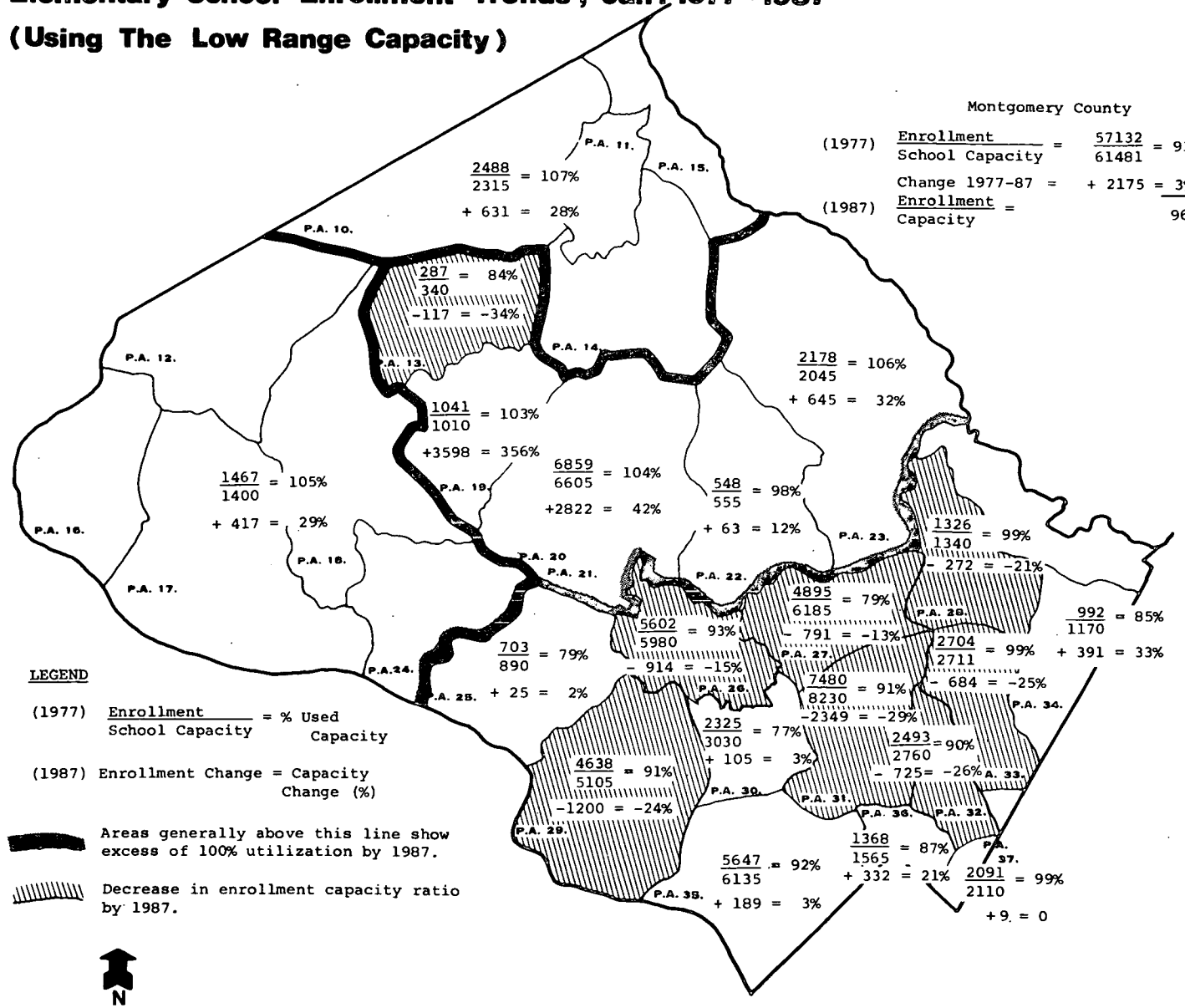


SOURCE : M-NCPPC

FIGURE 7.1

Elementary School Enrollment Trends, Jan. 1977-1987

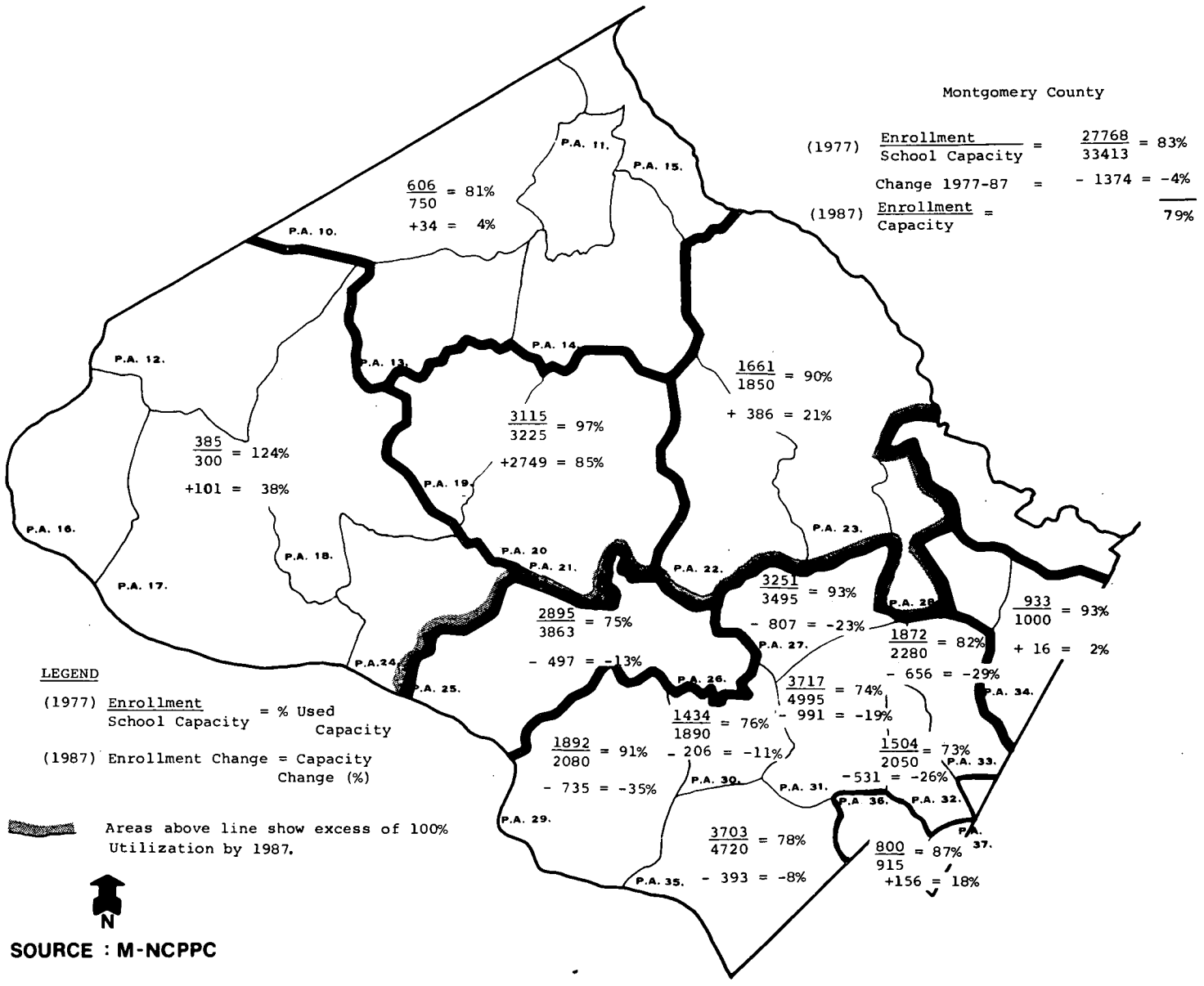
(Using The Low Range Capacity)



SOURCE : M-NCPPC

FIGURE 7.2

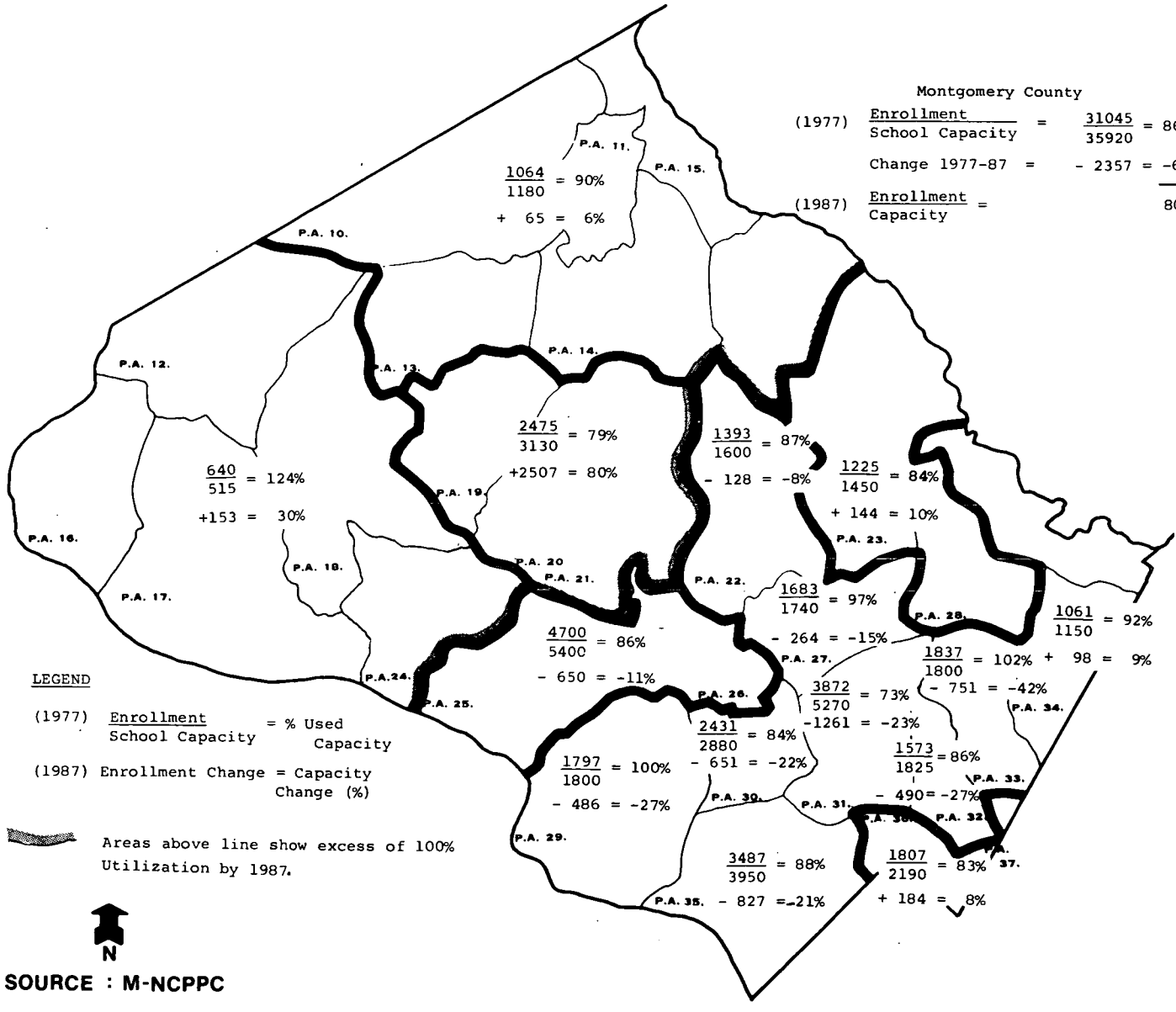
Junior High School Enrollment Trends, Jan. 1977-1987



SOURCE : M-NCPPC

FIGURE 7.3

High School Enrollment Trends, Jan. 1977-1987



SOURCE : M-NCPPC

FIGURE 7.4

TABLE 7.9

PROJECTION OF 7-9 GRADE SCHOOL ENROLLMENT, BY PLANNING AREA:
JAN. 1977-JAN. 1987

Forecast Area and Planning Area	Spring 1977 Actual[1] Enrollment	School Capacity	Capacity (Percent)	Projection[2] Jan. School Population 1977	Jan. School Population 1987	Enrollment Jan. 1987	Enrollment Change 1977-1987	1987 Capacity (Percent)
URBAN RING	17,304	21,928	79%	20,653	16,827	14,035	-3,269	64%
PA 26 Rockville & 25 Travilah	2,895	3,863	75	3,373	2,795	2,398	- 497	62
27 Aspen Hill	3,251	3,495	93	3,069	2,307	2,444	- 807	70
30 No. Bethesda	1,434	1,890	76	1,560	1,336	1,228	- 206	65
31 Wheaton & 95 (pt.)	3,717	4,995	74	5,217	3,826	2,726	- 991	55
32 Kemp Mill	1,504	2,050	73	1,916	1,240	973	- 531	47
35 Bethesda & 95 (pt.)	3,703	4,720	78	4,217	3,769	3,310	- 393	70
36,37 Silver Spring (pt.) & Takoma Park	800	915	87	1,301	1,554	956	+ 156	105
I-270 CORRIDOR								
PA 19,20,21 Germantown Gaithersburg	3,115	3,225	97%	3,026	5,697	5,864	+2,749	182%
COLESVILLE (pt	2,805	3,280	86%	2,530	1,919	2,165	- 640	66%
PA 33 Wht.Oak & Cloverly/ 28, 34 Fairland & Clv. (pt.	1,872 / 1 933	2,280 / 1,000	82 / 93	1,781 / 749	1,157 / 762	1,216 / 949	- 656 / + 16	53 / 95
POTOMAC								
PA 29 Potomac	1,892	2,080	91%	2,763	1,690	1,157	- 735	56%
OLNEY								
PA 22& 23 Rock Creek, Olney & Cloverly (pt.	1,661	1,850	90%	1,557	1,919	2,047	+ 386	111%
DAMASCUS								
PA 11&13 Damascus & Clarksburg	606	750	81%	1,059	1,119	640	+ 34	85%
POOLESVILLE	385	300	124%	577	728	486	+ 101	162%
TOTAL COUNTY	27,768	33,413	83%	32,165	29,899	26,394	-1,374	79%

[1]/Source: Montgomery County School Board
[2]/Source: Demographic Model with housing inputs based on pipeline development

Rock Creek, -128; and could be utilized to accommodate almost one-half of the projected increase in the up-County areas, through redesignated service areas and longer busing routes.

Impact of Current Elementary School Closings

Table 7.11 shows the impact of all elementary school closings to date on the school capacity existing in the affected areas. The school closings as of fall 1977 have reduced available capacity by 6,550 students. In general, the greatest capacity reductions have been accomplished in the Wheaton area, Colesville-White Oak area, and in the Bethesda area. Without the closings, the enrollment/capacity ratios in the affected areas would be 65 percent and with the closings this utilization ratio has been improved to 73 percent. Areas with remaining enrollment/ capacity ratios well below this figure, based on 1977 figures, are Aspen Hill and North Bethesda. By 1987 areas with enrollment/capacity ratios below this figure will be Kemp Mill, Colesville, Cloverly-Norwood, Wheaton,

TABLE 7.10

PROJECTION OF HIGH SCHOOL ENROLLMENT, BY PLANNING AREA:
JAN. 1977-JAN. 1987

Forecast Area and Planning Area	Spring 1977 Actual[1] Enrollment	School Capacity	Capacity (Percent)	Projection[2] Jan. School Population 1977	Jan. School Population 1987	Enrollment Jan. 1987	Enrollment Change 1977-1987	1987 Capacity (Percent)
URBAN RING	19,553	23,295	84%	20,150	15,973	15,594	-3,959	67%
PA 26 Rockville & 25 Travilah	4,700	5,440	86	3,201	2,758	4,050	- 650	75
27 Aspen Hill (pt.)	1,683	1,740	97	1,956	1,649	1,419	- 264	82
30 No. Bethesda	2,431	2,880	84	1,745	1,278	1,780	- 651	62
31 Wheaton	3,872	5,270	73	4,647	3,134	2,611	-1,261	50
32 Kemp Mill	1,573	1,825	86	1,867	1,285	1,083	- 490	59
35 Bethesda	3,487	3,950	88	4,574	3,489	2,660	- 827	67
36&37 Silver Spring & Takoma Park	1,807	2,190	83	2,160	2,380	1,991	+ 184	91
I-270 CORRIDOR								
PA 19,20,21 Germantown Gaithersburg,Olney(pt& 23,13 Clarksburg (pt.)	2,475	3,130	79%	2,621	5,276	4,982	+2,507	159%
COLESVILLE	4,123	4,400	94%	3,746	3,197	3,614	- 509	82%
PA 28 Cloverly & Olney (pt.	1,225	1,450	84	1,173	1,534	1,369	+ 144	94
33 White Oak	1,837	1,800	102	1,853	1,095	1,086	- 751	60
34 Fairland	1,061	1,150	92	520	568	1,159	+ 98	101
POTOMAC								
PA 29 Potomac	1,797	1,800	100%	2,437	1,778	1,311	- 486	73%
OLNEY Rock Crk. & PA 22,25 Aspen Hill (pt	1,393	1,600	87%	1,103	1,002	1,265	- 128	79%
DAMASCUS								
PA 11&13 Damascus & Clarksburg (pt	1,064	1,180	90%	984	1,044	1,129	+ 65	96%
POOLESVILLE	640	515	124%	539	668	793	+ 153	154%
TOTAL COUNTY	31,045	35,920	86%	31,580	28,938	28,688	-2,357	80%

[1]/Source: Montgomery County School Board
[2]/Source: Demographic Model with housing inputs based on pipeline development

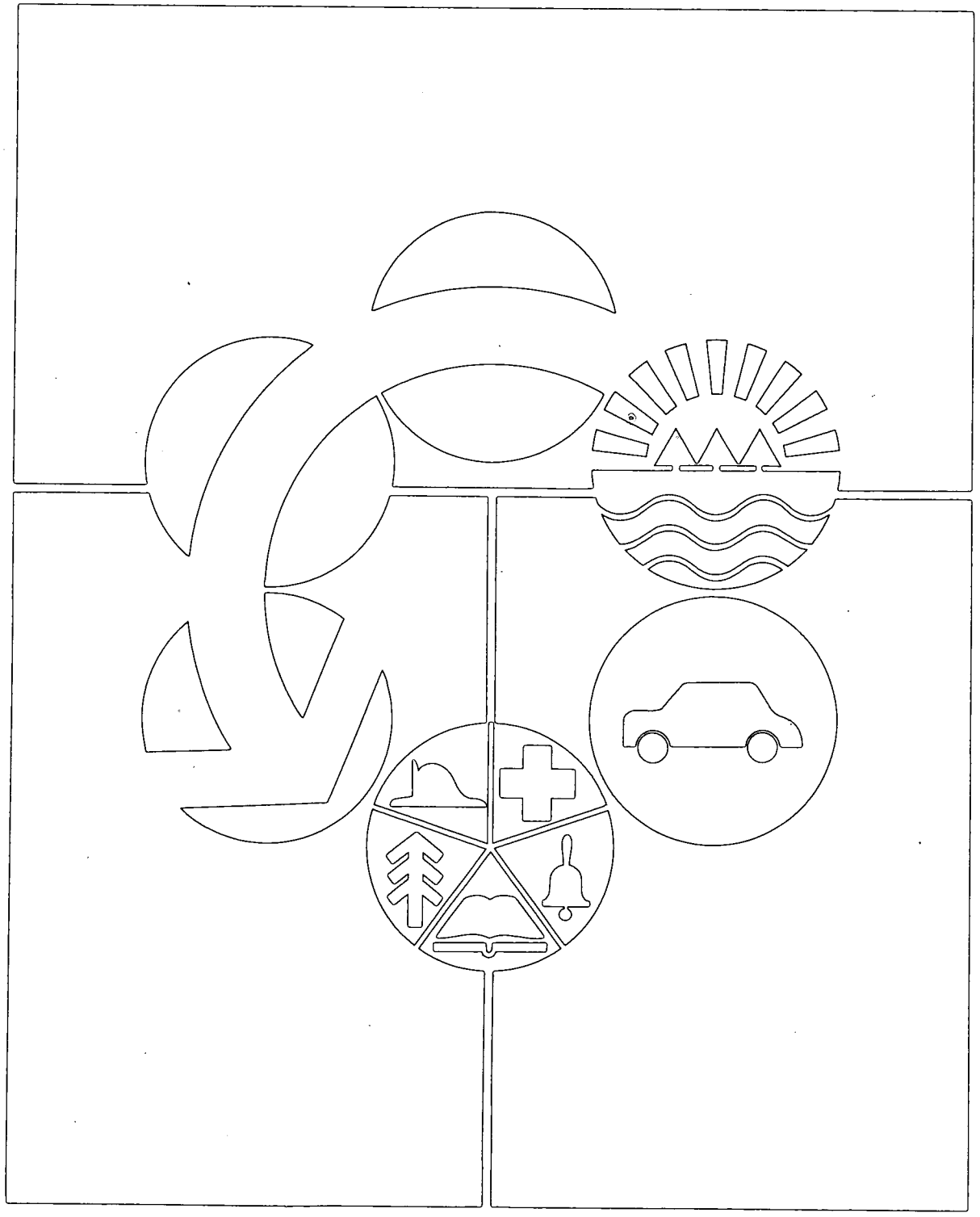
Aspen Hill, North Bethesda, Potomac, Rockville, and Clarksburg. These areas show a total enrollment decline of 7,165 by 1987, according to Planning Board projections.

TABLE 7.11

IMPACT OF ELEMENTARY SCHOOL CLOSINGS
SCHOOL YEAR 1973-74 TO 1977-78

Planning Areas	Capacity W/O Closings	Spring 1977 Enrollment	Capacity/ Enrollment Ratio	Reduction Due to School Closing	Change in Capacity
*26 Rockville	8,320	5,602	67%	920	67%-75%
27 Aspen Hill	7,430	4,895	66%	-	66%
28 Cloverly	1,620	1,326	82%	-	82%
29 Potomac	6,140	4,638	76%	-	76%
30 No. Bethesda	3,640	2,325	64%	-	64%
*31 Wheaton	12,705	7,480	59%	2,000	59%-70%
*32 Kemp Mill	4,025	2,493	62%	680	62%-79%
*33 White Oak	4,240	2,704	64%	1,100	64%-86%
34 Fairland	1,410	992	70%	-	70%
*35 Bethesda	8,895	5,647	63%	1,490	63%-76%
*37 Takoma Park	1,900	1,368	72%	360	72%-88%
TOTALS	60,325	39,470	65%	6,550	65%-73%

* Areas affected by school closings.



Chapter Eight

EXECUTIVE SUMMARY & RECOMMENDATIONS

CHAPTER VIII

EXECUTIVE SUMMARY AND RECOMMENDATIONS

This is the fourth in a series of annual growth policy reports. These reports are intended to help focus an evolving perspective of the growth management process in the County and to assist in the guidance and coordination of the many ongoing activities that together constitute that process over the year. This series of reports constitutes an organic whole, and reference to previous reports will assist the reader.

The first report, called Framework for Action, laid out a basic conceptual model of the growth management process, a description of the issues the County had to deal with, and a general policy approach to these issues, together with some specific strategy recommendations.

The second report, called Fiscal Impact Analysis, tested the fiscal implications of alternative future rates of growth. It also developed the concept of how to use fiscal impact analysis and other measures, such as levels of public service, so as to provide a computerized analytic tool that can be used to test a wide variety of possible growth options. This technical document was followed shortly thereafter by a policy document, entitled Sequel No. 1--Environment and Transportation. This sequel report dealt with the policy implications of the fiscal impact analysis, in the functional areas of environment and transporation, and recommended certain specific action strategies.

The third report, called Forecast--People, Jobs and Housing, was a technical report that documented the Planning Board's most recent forecasts. It included a detailed outline of the methodology and assumptions used in arriving at these forecasts, and was followed by discussions within the County as to the manner in which such forecasts should be used generally in the various parts of the planning process.

This year's fourth report, called Carrying Capacity and Adequate Public Facilities, is a logical extension of the previous work and continues the theme of examining each year, in detail, one major component or aspect of the growth management process.

The current report focuses on the presently existing Adequate Public Facilities Ordinance, and moves out from this point of focus to the broader conceptual base and technical underpinnings of the growth management system as a whole. The report concludes with some specific recommendations for amendments to the Adequate Public Facilities Ordinance, and with some proposals for improving other elements of the growth management system.

Chapter I traces the connection from the Adequate Public Facilities Ordinance through the rest of the growth management system, and concludes with specific action recommendations. Chapters II through VII are technical in nature and describe some detailed impact assessment measurements that have been made possible by the introduction of several new computerized monitoring systems.

Chapter I - Carrying Capacity and Growth Management

Chapter I outlines a narrative argument that seeks to weave together the separate concepts of carrying capacity, adequate public facilities, capital programming, and forecasting, into the single strand of a comprehensive growth management system. In the process, we have recommended:

1. *an amendment to the present Adequate Public Facilities Ordinance to extend the*

life of an approved preliminary subdivision plan from one year to three years, with a possible additional three-year extension, provided the developer furnishes evidence of having substantially complied with the staging plan he submitted with his original preliminary plan application; and

2. *a potential improvement in the application of the Adequate Public Facilities concept by shifting its focus from the Subdivision Ordinance to a County-wide staging element of the General Plan that could be translated into implementation through the Ten-Year Water and Sewerage Plan and, subsequently, into the other steps in the development process.*

The legal staff of the Commission has examined both of these recommendations and determined that both were feasible and justifiable within the statutes of the County and the State.

In addition to these recommendations, the argument has been brought up to the point of identifying three additional issues; namely,

1. *How accurately can we measure "level of service" among various public facilities?*

2. *How close a staging "fit" is necessary or desirable over time?*

3. *How can the twin levers of private land use regulation and public facility programming be coupled together to best achieve the "fit" that the County's policy sets as a goal?*

This report cannot provide a definitive recommendation on these three issues, but it does provide a conceptual base and the information base upon which a well-informed decision can be made. This chapter takes the analogy of the need for a nutcracker force applied simultaneously above and below, to squeeze the private and public growth rates so that they stay close together, and diagrams this concept in the form of a pair of pliers.

Two elements are necessary for a pair of pliers to exert force efficiently. One is a fulcrum/pivot bar that is strong enough to withstand the opposing forces coming from both directions; and the other is a handle length sufficiently long to allow the principles of mechanical leverage to operate, and thereby reduce the amount of force required to manipulate the tool. If by analogy the two opposing teeth of the pliers are the public and private implementation processes, then the fulcrum/pivot bar that must withstand the full weight of the opposing forces may be characterized as constituting either the APF Ordinance in its present form, or alternatively a County-wide staging plan, if the concept outlined in this report were to be pursued.

An argument is made in this chapter that the relative leverage of measurement technology afforded by the APF Ordinance is significantly less than might be achieved by working at the County-wide scale. Under this hypothesis, a growth management system that used a County-wide staging plan as its fulcrum/pivot would be easier to operate or, alternatively, could provide greater effective power through improved leverage than would a system that used an APF Ordinance for its fulcrum pivot.

A County-wide staging plan based on a comprehensive Adequate Public Facilities assessment could be developed within approximately one year from the present. This goal now appears achievable because of the completion within the last month or so of several

important and necessary monitoring and modeling tools. These tools, together with the completion of a few more that could be brought on line within the next year, offer the promise of being able to systematically cross-reference and integrate the future condition of the various public facility systems to a greater extent than has been possible in the past. In particular, we are referring to:

1. *a new computerized system for mapping and calculating the capacity of the vacant and redevelopable land in the County (see Chapter IV);*

2. *a computerized water and sewerage monitoring and simulation system, currently used by the Sanitary Commission only for accounting purposes, but which could be expanded to simulate future conditions (see Chapter V);*

3. *a new roadway intersection, level of service, inventory of the County, and a new and more detailed traffic modeling technique, that permits the simulation of traffic onto a road network at a grain fine enough to correlate closely with the highway capital program (see Chapter VI);*

4. *a computerized demographic model with which to forecast the changes in age characteristics by subareas of the County, which information can then be used to more effectively analyze the future needs for various community point facilities, such as schools, and possibly others such as health clinics, etc. (see Chapter VII).*

5. *a computerized fiscal accounting system developed for the 1975 growth policy report, which has subsequently been refined and updated with respect to its assessable base parameters and could be further applied to the analysis of a County-wide staging plan.*

The following chapters of this report elaborate on the theme of this chapter by representing the results of various detailed technical measurements and forecasts. Chapter II is presented for approval by the County Council as the general purpose ten-year forecast to 1987, as well as for approval of the basic approach to be followed in the next round of cooperative forecasting for the twenty-year time frame at the Council of Governments. Chapter III through VII constitute a demonstration project of the kind of technical analysis and measurement that could be performed more thoroughly and for a greater number of alternative end states during the next year.

Chapter II - Forecast: 1977-1987 and Beyond
An analysis of current trends and a proposed ten-year forecast for population, employment and housing is made. Data sources and methodology are listed and their contents explained. A different approach for forecasting beyond the ten-year period is proposed.

At this date there is insufficient evidence to revise the trend of household population and employment growth that was presented in the 1976-1986 Forecast. County development indicators are being closely monitored, but there is nothing which differs significantly from the trends analyzed to produce last year's forecast. The Demographic Model remains available as a forecasting tool, and will be updated with data from the 1977 Census Update when it becomes available over the course of the coming year.

For the period beyond ten years, two alternative growth scenarios already have been developed from which to

derive 1995 projections. The lower growth scenario is effectively an extenion of the ten-year forecast which, in turn, is a continuation of current trends in the housing market. The high growth scenario is an extension of the County's high growth rate as witnessed in the late 1960's and early 1970's.

It is proposed to use these two scenarios as the base from which other alternative long-range scenarios shall be developed during the next round of COG's Cooperative Forecasting process, with the understanding that checkpoint meetings between Planning Board staff and County Council and other relevant County agencies will be held at the Council's convenience during the process of alternative scenario construction at COG.

Chapter III - The Development "Pipeline" and "Pre-Pipeline"

The development "pipeline" and "pre-pipeline" are defined in this chapter. The method of arriving at the pipeline total and geographic location is also described. Detailed tables show sewer allocation for the various ongoing programs. A brief comparison between the development "pipeline" and the ten-year Forecast is made.

The development "pipeline" is defined as the sum of all past and present WSSC approvals for sewer service, including previously approved but still outstanding commitments, the allocations under the Interim Sewer Service Policy (ISSP), the Rock Creek Consortium, and the various private sewer plants, as well as a staff estimate of probable construction on septic tank systems for the period 1977-87, which is the time frame roughly equated with the build-out schedule of the "pipeline" total. The total of the development "pipeline" is approximately 42,800 dwelling units. The geographic allocation of the development "pipeline" is similar to the ten-year Forecast, although the total is portrayed, as well as the definition and methodolgy used to derive that inventory. The inventory lists the dwelling unit holding capacity by major residential land use and sewer service categories.

The present pattern of development and zoning is adhering fairly closely to the General Plan. Under existing zoning there is enough vacant land (defined as land which at present has no improvement, or improvement worth less than the land value, or farm assessment) for an estimated 173,000 dwelling units. Of this total, about 100,000 dwelling units can be accommodated within the current sewer envelope. There is more than twice the land needed for the "pipeline." The ten-year Intermediate Forecast would, however, use most of the available small-lot single-family and garden apartment land outside of the I-270 Corridor and Colesville area. The twenty-year Intermediate Forecast would use up a very large proportion of the present sewer envelope, while the twenty-year Trend Forecast would more than use it all.

Chapter V - Impact of "Pipeline" On Water And Sewer

This chapter assesses the impact of the amount of new growth in the "pipeline" and on the capacity of currently programmed water and sewerage system transmission lines and treatment plants. The discussion amount in the "pipeline" is somewhat lower than in the Forecast. The development "pipeline" numbers are the basic inputs to the impact assessment in Chapters IV, V, VI, and VII.

Chapter IV - Impact of "Pipeline" on Present Zoning Capacity

This is an assessment of the relationship between the amount of residential growth in the pipeline and the County's unused residential holding capacity under existing zoning. A preliminary inventory of vacant land

is divided into three functional categories--sewerage, water supply, and stormwater.

Sewerage - A computerized model of the capacities of the transmission network would be extremely valuable. With some modification, Washington Suburban Sanitary Commission's SSCAN computer program could be used to simulate average and peak flows based upon existing and future pipeline development. This program could help decision makers determine the adequacy of public facilities and the staging of growth. A demonstration analysis of the sewer system network, which considers only the hydraulic capacity of the existing sewer, concludes that some County capital projects possibly could be postponed.

Existing treatment capacity is sufficient for both the "pipeline" and the growth anticipated by the intermediate forecast through the early 1980's. Additional treatment capacity will be required before 1985.

Water Supply - Water supply will be adequate for pipeline development with the implementation of drought management techniques. Lake Site #3 can provide an efficient storage capacity for emergency water supply.

Stormwater - Stormwater runoff associated with the increment of pipeline development can be handled by existing stormwater management policies, including sedimentation and erosion controls.

Chapter VI - Impact of "Pipeline" On Transportation

First, existing levels of service are determined for the highway system, using several new tools developed by Planning Board staff. Second, the impact of traffic generated by the "pipeline" and by forecasted employment growth are analyzed. Next, this impact assessment is translated into recommendations for future State and County road improvement programs. Lastly, a concept for managing growth by examining traffic on a macro traffic shed level is outlined.

The existing highway level of service analysis reveals a significant number of intersections currently operating at low levels of efficiency. Under highway impact assessment, it is found that excess congestion is concentrated in the I-270 Corridor with lesser concentrations on upper U.S. Route 29 and upper Georgia Avenue. Intersections related to the corridor between Gaithersburg and Rockville are the most heavily impacted.

Under CIP recommendations, the higher priority projects coincided with growth in the I-270 Corridor, including improvements to Route I-270 and interchanges, the Eastern Arterial, and Rockville Facility/Intercounty Connector.

Under growth management, the concept presented focuses on measuring the impact of growth at an aggregated scale rather than on a subdivision-by-subdivision basis. A transportation model would be used to analyze the impact of incremental growth on marginal and critical transportation links. Limitations would be placed on growth within specified traffic sheds, if connections could be traced to adversely impacted highway links. These limitations would be removed as transportation improvement projects were programmed to eliminate critical situations.

Chapter VII - Impact Of "Pipeline" On Schools

This chapter assesses the relationship between the amount of new growth in the "pipeline" and the capacity of programmed school facilities, including an exploration of the use of the computerized demographic modelling system to forecast shifts among population age groups that would affect school enrollment. As a

demonstration, the model is used to translate the total dwelling units in the "pipeline" into future population in the school age groups, representing the demand for school pupil space, which is then compared with an inventory of school buildings and space which constitutes the available supply of space and facilities. The study analyzes this demand/supply relationship for elementary, junior high, and senior high school levels, over the 1977-87 period, which is assumed to be roughly comparable with the build-out period of the "pipeline."

Elementary Schools - Up-County area schools are generally expected to have enrollment increases which will cause existing schools to operate at over 100 percent of capacity by 1987. Most down-County elementary schools will have decreased enrollments.

Junior High Schools - While little change is expected in the overall utilization ratios, some areas will experience substantial changes by 1987. For example, enrollment in the I-270 Corridor is expected to increase by almost 90 percent. In the areas below Rockville, major decreases are expected in the range of 20 to 30 percent.

Senior High Schools - County-wide school enrollment would decrease by over 2,300 students by 1987. The only areas of the County where senior high school enrollments are projected to increase, and result in enrollments which will exceed existing capacities, are in Gaithersburg, Germantown, Damascus, and Poolesville. Elsewhere, enrollments are projected to change only modestly, except in the Bethesda, Potomac and North Bethesda areas, where the combined enrollment decline is expected to be almost 2,600 students.

Action Recommendations
On the basis of the above line of reasoning, the Planning Board recommends that the County Council concur in the following five specific actions:

1. *That the County Council approve the ten-year forecast as outlined in Chapter II of this report as the County's official general purpose forecast, and concur in the approach outlined for developing twenty-year forecasts in conjunction with the Council of Governments' Cooperative Forecasting Process, with the understanding that checkpoint meetings between Planning Board staff and County Council will and other relevant County agencies be held at the Council's convenience during the process of alternative scenario construction in the COG Cooperative Forecasting Process.*

2. *That the Planning Board prepare an amendment to the Adequate Public Facilities Ordinance for County Council Public Hearing and adoption that would provide for approved preliminary plans to have a life span of three years before resubmission for Board approval and possible extension for a second three-year period, provided that the developer has carried out construction in substantial compliance with the staging plan submitted at the time of initial subdivision approval.*

3. *That the Planning Board shall with the Washington Suburban Sanitary Commission, the Board of Education, and the relevant agencies or departments of County government develop the component elements of growth management accounting system in such a way that the monitoring accounts of each agency are compatible with, and complementary to, those of all the*

other agencies.

4. *That the Planning Board produce the next County growth policy report in early December, 1978, in order that it may be available for use by the incoming County government when it takes office in January, 1979, and include in this growth policy report a set of detailed proposals showing how the capacities and staging of the transportation, environment and community facility systems could be brought into harmony with each other, and related to a desirable growth rate for the County, within the context of a County-wide staging plan.*

5. *That the County Council use the "pipeline" impact assessment details presented in Chapters III through VII of this report as a reference guide to decision making during the forthcoming capital programming and budget session and direct the Planning staff to make such additional technical studies as the Council may feel desirable and practical within the time available.*

NOTES

Chapter One

Chapter Two

Chapter Three

Chapter Four

ERRATA SHEET

The following text replaces page 8-5 in Chapter VIII of Growth Policy: Carrying Capacity & Adequate Public Facilities:

derive 1995 projections. The lower growth scenario is effectively an extension of the ten-year forecast which, in turn, is a continuation of current trends in the housing market. The high growth scenario is an extension of the County's high growth rate as witnessed in the late 1960's and early 1970's.

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Chapter V - Impact of "Pipeline" On Water And Sewer

This chapter assesses the impact of the amount of new growth in the "pipeline" on the capacity of currently programmed water and sewerage system transmission lines and treatment plants. The discussion

Chapter Five

Chapter Six

Chapter Seven

Chapter Eight

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